GEOLYSE

ANNUAL ENVIRONMENTAL MANAGEMENT REPORT

LITHGOW SOLID WASTE FACILITY – EPL 6004

OCTOBER 2013 - SEPTEMBER 2014

PREPARED FOR

CITY OF LITHGOW COUNCIL

NOVEMBER 2014

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The preparation of this report has been in accordance with the project brief provided by the client and has relied upon the information, data and results provided or collected from the sources and under the conditions outlined in the report.

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Introduction

1.1 BACKGROUND

The Lithgow Solid Waste Facility operates as a scheduled activity for waste disposal (application to land). The facility accepts all solid wastes consistent with this classification, including putrescible wastes and other wastes approved by the Environment Protection Authority (EPA).

The facility is owned by City of Lithgow Council and has been in operation for approximately 70 years. The management and operation of the depot is undertaken in accordance with Environment Protection Licence (EPL) No. 6004 issued under Section 55 of the *Protection of the Environment Operations Act 1997* (the Act). The depot is located approximately 4 kilometres north-west of Lithgow.

1.2 LICENCE REQUIREMENTS

EPL No. 6004 governs the design, construction, operation, monitoring and rehabilitation of the facility in accordance with the Act.

Section 5 of the licence provides instructions on environmental monitoring requirements. Specifically, Condition M2.1 describes the requirements to monitor landfill gas and the concentration of pollutants discharged to groundwater, surface water and leachate.

Annual reporting requirements are outlined in Condition R1.1:

"R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:

- a Statement of Compliance; and
- a Monitoring and Complaints Summary……"

The deadline for the Annual Return that is outlined in condition R1.5 states:

"R1.5 *The Annual Return for the reporting period must be supplied to the EPA by registered post no later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').*"

The reporting period is consistent with the enforcement period of the EPL and is from 24 September 2013 to 23 September 2014.

The monitoring period of this report is from January 1999 (when monitoring began at the facility) through to the end of the 2013/14 reporting period (i.e. 23 September 2014).

1.2.1 LICENCE VARIATION (NOTICE NO. 1515576) 4 SEPTEMBER 2013

A range of licence variations applicable to EPL No. 6004 have been issued by the EPA. The most recent licence variation occurred close to the end of the 2012-2013 reporting period and as such is deemed to come into effect for the 2013-2014 reporting period. In summary, the licence variation addressed:

- Update of property descriptors at condition A2.1 following review of the NSW spatial information exchange;
- Update the wording at condition A4.2;
- Update the location descriptions at condition P1.1;
- Update the location descriptions at conditions P1.2/P1.3;

- Streamline the waste table at condition L3.1 via the accompanying note;
- Remove the tyre conditions at conditions L3.2 to L3.4 and move them to the operating conditions portion of the licence;
- Update the noise limits in their entirety at conditions L4.1 to L4.5 to ensure that they are appropriate to the premises;
- Include the odour condition at condition L5.1 which should have formed part of the licence and is in keeping with best practice conditions for landfills;
- Streamline the emergency response conditions at section O4 through the removal of condition O4.2 which is in essence effectively covered by the PIRMP and the other conditions;
- Streamline, update and re-arrange section O5 and O6 in their entirety (including the removal of the completed weighbridge condition);
- Remove a further two contaminants/analytes (being barium and cobalt) from groundwater and surface water at condition M2.3;
- Update the frequency for EPA Identification Point 6 in keeping with best practice conditions for landfills; this increases surface water monitoring from biannual during discharge to monthly during discharge;
- Update the monitoring report conditions at condition R1.9; this now includes the achieved compaction rate (excluding cover material) for the premises and the remaining disposal capacity for the premises;
- Include an additional reporting condition at condition R4.3 in keeping with best practice conditions for landfills; this requires the licensee to notify the EPA within 24 hours by telephoning the Environment Line service on 131 555 if any landfill gas monitoring required by this licence detects methane above 1.25%(v/v), and increase the frequency of monitoring to daily, until the EPA determines otherwise;
- Remove the second general condition at G2.2; and
- Include a Pollution Studies and Reduction Program at condition U1.1 to address potential water management issues.

1.3 REPORT STRUCTURE

This report is divided into five sections:

- **Section 1** – presents a brief introduction and background to the report;
- **Section 2** – provides an overview of the environmental monitoring program undertaken at the facility during the licence period;
- **Section 3** – presents the results and discussion of data collected during the reporting period and overall monitoring period;
- **Section 4** – presents a summary of the results as described in Section 3; and
- **Section 5** – presents the conclusions and recommendations for future monitoring.

Environmental Monitoring Program

2.1 OVERVIEW

Environmental monitoring has been undertaken at the Lithgow Solid Waste Facility since January 1999 and has included groundwater, surface water, leachate, and landfill gas. This monitoring continued throughout the 2013 – 2014 reporting period. A summary of monitoring undertaken in the reporting period is shown in **Table 2.1**.

It is noted that surface water monitoring was not undertaken

Table 2.1 - Summary of Monitoring undertaken in the 2013 – 2014 Reporting Period

Date	Groundwater		Surface Water Quality	Leachate Quality	Landfill Surface Gas
	Levels	Quality			
Oct. 2013	✓	✓	*	*	✓
Nov. 2013			*		✓
Dec. 2013			*		✓
Jan. 2014			*		✓
Feb. 2014			*		✓
Mar. 2014			*		✓
Apr. 2014	✓	✓	✓	✓	✓
May 2014			*		✓
Jun. 2014**	✓	✓	*	✓	✓
Jul. 2014			*		✓
Aug. 2014			*		✓
Sep. 2014			*		✓

Notes:
* Monitoring point not discharging or dry
** MB5 sampled in June 2014 following repairs, and LW1 sampled for Total Phenolics in June 2014 (instead of Apr-14)

2.1 GROUNDWATER

The groundwater monitoring network is illustrated in **Drawing 01B_EV04**. The network consists of seven (7) piezometers. The piezometers are identified as MB1, MB5, MB6-B, MB9, MB10, (EPL Points 1–5), MB12 and MB14 (EPL Points 7-8).

Groundwater level measurements and quality sampling commenced in January 1999 at all monitoring stations, except at MB11, MB12, MB13 and MB14 which were installed in January 2002. Prior to January 2001, three initial monitoring rounds were conducted at the existing piezometers. Geolyse (then named Terra Consulting) was commissioned to carry out quarterly monitoring at the site from this date forward. The 4 October 2011 licence variation reduced the required frequency from quarterly to biannual.

Monitoring station MB6-B was installed in August 2006 to replace MB6 which was no longer functional. The replacement monitoring station MB6-B was positioned approximately 6m north-east of MB6. Monitoring station MB6 was then decommissioned and plugged with a bentonite grout to maintain aquifer integrity and to negate the potential for increased contamination pathways. For the purpose of this report, MB6-B is referred to as MB6 when results after August 2006 are discussed.

The MB6 piezometer is located up-gradient of the landfill area and within a surface water diversion drain. Approximately three years ago the landfill area was extended to allow an access road to be constructed, which resulted in fill being moved into close proximity of the piezometer. This fill batter and drain often contains quantities of litter from the landfill operations.

Due to significant fluctuations in a number of parameters at MB6 over recent years, works to limit surface water ingress as recommended in the 2012 AEMR were undertaken in June 2013. These works included:

- The area around the piezometer was cleared of rubbish; and
- The area around the piezometer tube was excavated for a depth of approximately 0.5m and extending in a 1m radius from the tube and then filled with compacted clay material.

In the April 2014 monitoring round, it was noted that MP5 had sustained damaged and required repairs to enable sampling. Samples were subsequently obtained in June 2014 following the necessary repairs.

Monthly groundwater level measurements and gas monitoring commenced in September 2001. As of 4 October 2011, the frequency requirement was reduced to biannual for groundwater monitoring. Gas monitoring is required on a monthly basis at EPA Point 10.

Groundwater sampling was not undertaken at MB1 during the reporting period as this monitoring point remained dry at the time of each biannual sampling round. The laboratory analyte list and frequency of analysis are provided in Error! Reference source not found.. Note that since the 4 September 2013 licence variation, barium and cobalt are no longer required to be monitored.

Table 2.2 – Summary of Groundwater Monitoring undertaken in the 2013 – 2014 Reporting Period

Parameter	Required Frequency	October 2013	April 2014	June 2014*
Temperature[1] (field)	N/A	✓	✓	✓
pH (field[1] + laboratory)	Biannual	✓	✓	✓
Electrical Conductivity (field[1] + laboratory)	Biannual	✓	✓	✓
Alkalinity ($CaCO_3$)	Biannual	✓	✓	✓
Aluminium	Biannual	✓	✓	✓
Ammonia	Biannual	✓	✓	✓
Chemical Oxygen Demand	Biannual	✓	✓	✓
Calcium	Biannual	✓	✓	✓
Chloride	Biannual	✓	✓	✓
Chromium (hexavalent)	Biannual	✓	✓	✓
Chromium (total)	Biannual	✓	✓	✓
Fluoride	Biannual	✓	✓	✓
Iron	Biannual	✓	✓	✓

Table 2.2 – Summary of Groundwater Monitoring undertaken in the 2013 – 2014 Reporting Period

Parameter	Required Frequency	October 2013	April 2014	June 2014*
Magnesium	Biannual	✓	✓	✓
Manganese	Biannual	✓	✓	✓
Nitrate	Biannual	✓	✓	✓
Pesticides (OCP's & OPP's)	Biannual	✓	✓	✓
Phosphorus	Biannual	✓	✓	✓
Potassium	Biannual	✓	✓	✓
Sodium	Biannual	✓	✓	✓
Standing Water Level	Biannual	✓	✓	✓
Sulfate	Biannual	✓	✓	✓
Total Dissolved Solids	Biannual	✓	✓	✓
Total Organic Carbon	Biannual	✓	✓	✓
Total Petroleum Hydrocarbons	Biannual	✓	✓	✓
Total Phenolics	Biannual	✓	✓	✓

Note:
[1] Not required by EPL 6004.
* MB5 sampled in June 2014 due to damage in April 2014

2.2 SURFACE WATER

The surface water monitoring network consists of a single monitoring point SW1 (EPL Point 6). The location of the surface water monitoring point is illustrated in **Drawing 01B_EV04**. The laboratory analyte list and frequency of analysis are provided in Error! Reference source not found.. The 4 September 2014 licence variation increased the required frequency of monitoring at SW1 to monthly during discharge, and since that variation, barium and cobalt are no longer required to be monitored.

Table 2.3 – Summary of Surface Water Monitoring undertaken in the 2013 – 2014 Reporting Period

Parameter	Required Frequency	April 2014
Temperature[1] (field)	N/A	✓
pH (field[1] + laboratory)	Monthly[2]	✓
Electrical Conductivity (field[1] + laboratory)	Monthly[2]	✓
Alkalinity ($CaCO_3$)	Monthly[2]	✓
Aluminium	Monthly[2]	✓
Ammonia	Monthly[2]	✓
Chemical Oxygen Demand	Monthly[2]	✓
Calcium	Monthly[2]	✓
Chloride	Monthly[2]	✓
Chromium (hexavalent)	Monthly[2]	✓
Chromium (total)	Monthly[2]	✓

Table 2.3 – Summary of Surface Water Monitoring undertaken in the 2013 – 2014 Reporting Period

Parameter	Required Frequency	April 2014
Fluoride	Monthly[2]	✓
Iron	Monthly[2]	✓
Magnesium	Monthly[2]	✓
Manganese	Monthly[2]	✓
Nitrate	Monthly[2]	✓
Pesticides (OCP's & OPP's)	Monthly[2]	✓
Phosphorus	Monthly[2]	✓
Potassium	Monthly[2]	✓
Sodium	Monthly[2]	✓
Sulfate	Monthly[2]	✓
Total Suspended Solids	Monthly[2]	✓
Total Organic Carbon	Monthly[2]	✓
Total Phenolics	Monthly[2]	✓
Total Petroleum Hydrocarbons	Monthly[2]	✓

Note:
[1] Not required by EPL 6004.
[2] During discharge – April 2014 was the only month where discharge occurred at SW1 during the 2013/14 reporting period

2.3 LEACHATE

Leachate quality is monitored on a biannual basis from the leachate monitoring station located to the south-west of the site, at the neighbouring sewage treatment plant. Specifically, leachate is sampled from the drainage into the sump that collects leachate for recirculating to the landfill. This leachate collection point is identified as LW1 (EPL Point 9) and is shown in **Drawing 01B_EV04**. Sampling was undertaken at LW1 during April 2014 and in June 2014 for Total Phenolics which was omitted from the April 2014 analysis. LW1 was dry at the time of the October 2013 monitoring round.

The laboratory analyte list and frequency of analysis are provided in Error! Reference source not found..

Table 2.4 – Summary of Leachate Monitoring undertaken in the 2013 – 2014 Reporting Period

Parameter	Required Frequency	October 2013	April 2014	June 2014
Temperature[1] (field)	N/A	*	✓	**
pH (field[1] + laboratory)	Biannual	*	✓	**
Electrical Conductivity[1] (field + laboratory)	N/A	*	✓	**
Alkalinity	Biannual	*	✓	**
Ammonia	Biannual	*	✓	**
Calcium	Biannual	*	✓	**
Chloride	Biannual	*	✓	**
Fluoride	Biannual	*	✓	**
Iron	Biannual	*	✓	**

Table 2.4 – Summary of Leachate Monitoring undertaken in the 2013 – 2014 Reporting Period

Parameter	Required Frequency	October 2013	April 2014	June 2014
Magnesium	Biannual	*	✓	**
Manganese	Biannual	*	✓	**
Nitrate	Biannual	*	✓	**
Potassium	Biannual	*	✓	**
Sodium	Biannual	*	✓	**
Sulfate	Biannual	*	✓	**
Total Organic Carbon	Biannual	*	✓	**
Total Phenolics	Biannual	*	Not analysed	✓

Note:
[1] Not required by EPL 6004
* Monitoring point dry
** Already analysed in April 2014 monitoring round

2.4 LANDFILL GAS

Landfill gas monitoring involves surface gas measurements in completed areas of the landfill and monitoring of accumulated gas in buildings within 250m of the landfill area. Surface gas monitoring was conducted on a monthly basis using a GA2000 Landfill Gas Analyser calibrated for methane.

Surface gas monitoring involves traversing the landfill on foot with a gas monitor detecting air quality 50 millimetres above the landfill surface. A grid sampling pattern was utilised for systematic sampling. Depressions and gullies immediately adjacent to the landfill site are also monitored. The demountable office and storeroom located at the landfill, as well as the Sewage Treatment Plant office, crib, workshop and control room were monitored.

2.5 QUALITY CONTROL

A quality control program was developed to ensure that any contamination originating from the sampling method was identified. The program consisted of field blanks and duplicates.

The QA samples collected were as follows:

- One trip blank comprised of distilled water decanted directly into the standard sample bottles (Sample W9001); and
- One duplicate sample collected from a piezometer at random during each biannual sampling round (Sample W9003).

An equipment blank was not utilised as a new disposable bailer was used at each of the groundwater sampling locations.

Environmental Monitoring Results

3.1 INTRODUCTION

The results of all groundwater, surface water, leachate and landfill gas monitoring undertaken at the landfill since January 1999 are presented and discussed in this section. The discussion focuses on the data collected in this reporting period (i.e. October 2013 to September 2014), yet includes all previous data where relevant. Deficiencies in monitoring, environmental incidents and remedial actions undertaken to correct any problems or deficiencies are also included in this section. Provisional limits are yet to be established under a Landfill Environmental Management Plan (LEMP) for the site. Where applicable, results reported in this AEMR are compared to relevant Australian guidelines.

Monitoring data is summarised in the tables of **Appendix A**. All laboratory reports and chain-of-custody documentation are included in **Appendix B**.

3.2 GROUNDWATER

Groundwater monitoring consisted of biannual water level measurements and quality sampling at monitoring locations MB5, MB6-B, MB9, MB10, MB12 and MB14. Monitoring point MB5 was sampled in June 2014 rather than the biannual April 2014 round following repair work.

No groundwater quality data was able obtained from MB1 as this monitoring station was dry at the time of each biannual sampling round.

3.2.1 LEVELS

Groundwater level measurements are presented for all monitoring points in **Appendix A** and are illustrated below in **Figure 1**.

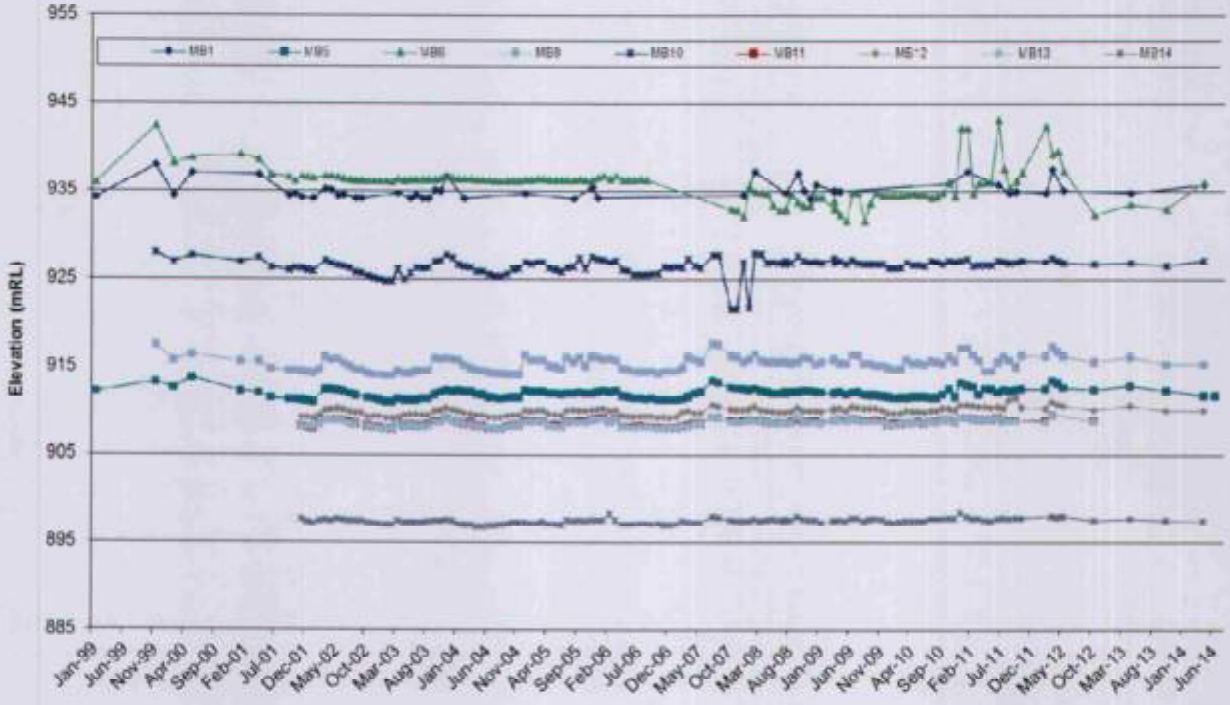

Figure 1: **Groundwater levels – Lithgow Solid Waste Facility, January 1999 to June 2014**

Groundwater levels remained relatively constant throughout the reporting period, with some degree of variation observed at each monitoring station. The most notable fluctuations were again observed at MB6 which recorded the largest change of 2.97m between October 2013 and April 2014. All standing water levels were consistent with historical ranges.

From the data it can be concluded that the hydraulic gradient falls in a south-south-westerly direction at a rate of 0.050m/m, generally consistent with the fall of the land. The observed groundwater levels indicate that MB6 is up-gradient of the landfill and MB5, MB9, MB12 and MB14 are down-gradient monitoring points (with MB14 the most down-gradient). This is consistent with the findings of Jewell (2001).

3.2.2 QUALITY

Physical Properties

Some groundwater sample temperatures were lower than those which have been recorded historically, with new minimum values detected at MB5 in October, and MB6, MB10 and MB14 in April. Reporting period temperatures ranged from 12.1°C at MB14 to 15.9°C at MB5, both in April 2013.

Chemical Properties

Measurements of pH across the site (**Figure 2**) ranged from strongly acidic to relatively neutral, with values ranging from 3.40pH units at MB12 to 7.39pH units at MB14. All values were within established ranges.

The mean pH measurements for the reporting period were 6.73pH units (MB5), 6.70pH units (MB6), 6.49pH units (MB9), 6.68pH units (MB10), 4.63pH units (MB12) and 7.36units (MB14). pH was observed to become generally more acidic during the reporting period relative to the 2012/2013 reporting period, excepting an increase in pH at MB12 between October 2013 and April 2014 to 5.85pH units. Monitoring station MB12 continues to be the most acidic monitoring site and the only site to be outside the range recommended as suitable for livestock drinking water (6.5-8.5pH units, Marckwick, 2007).

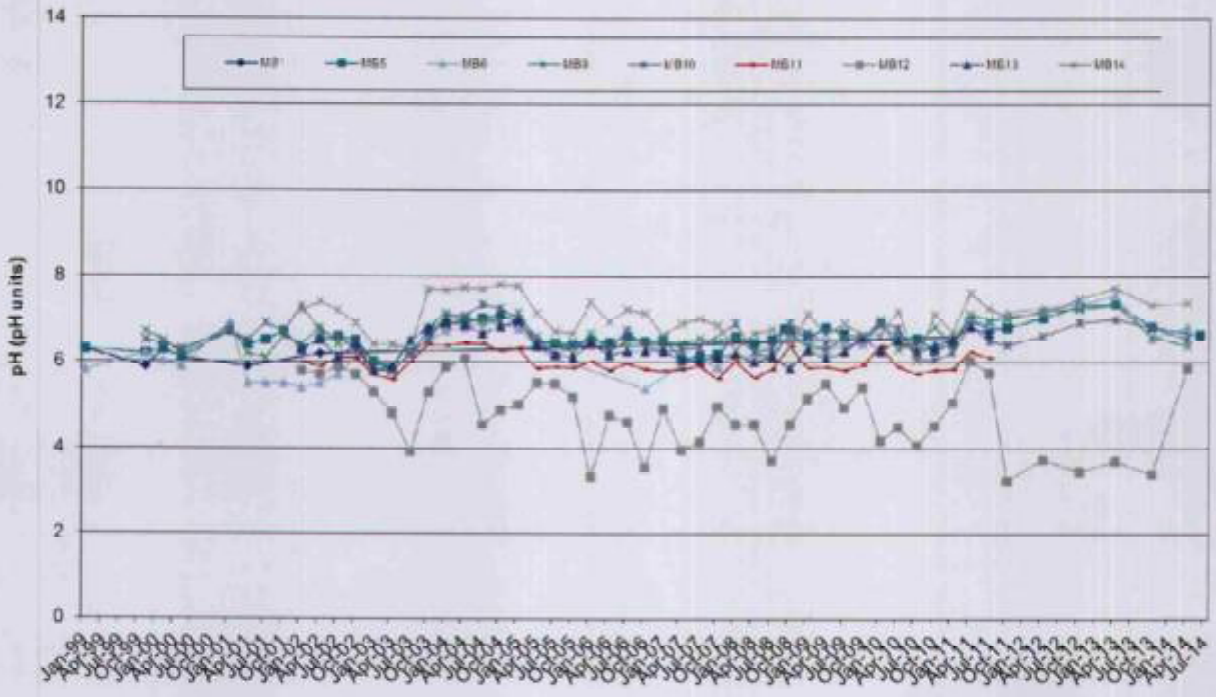

Figure 2: Groundwater pH – Lithgow Solid Waste Facility, January 1999 to June 2014

Electrical Conductivity (EC) measurements are presented in **Figure 3**.

Electrical conductivity across the site ranged from 129µS/cm (MB10, April 2014) to 4510µS/cm (MB6, April 2014). The most significant change recorded was the increase of 2100µS/cm at MB6 between the October and April rounds. All values were consistent with the established ranges excepting MB12 which recorded a new maximum value (1350µS/cm, October 2013), and MB14 which recorded a new minimum value (255µS/cm, April 2014).

Mean EC concentrations for groundwater collected from across the site ranged from 264µS/cm at MB10 to 3460µS/cm at MB6. All values were below the upper value of livestock drinking water guideline range (4700µS/cm) for the most susceptible category, poultry (ANZECC & ARMCANZ, 2000).

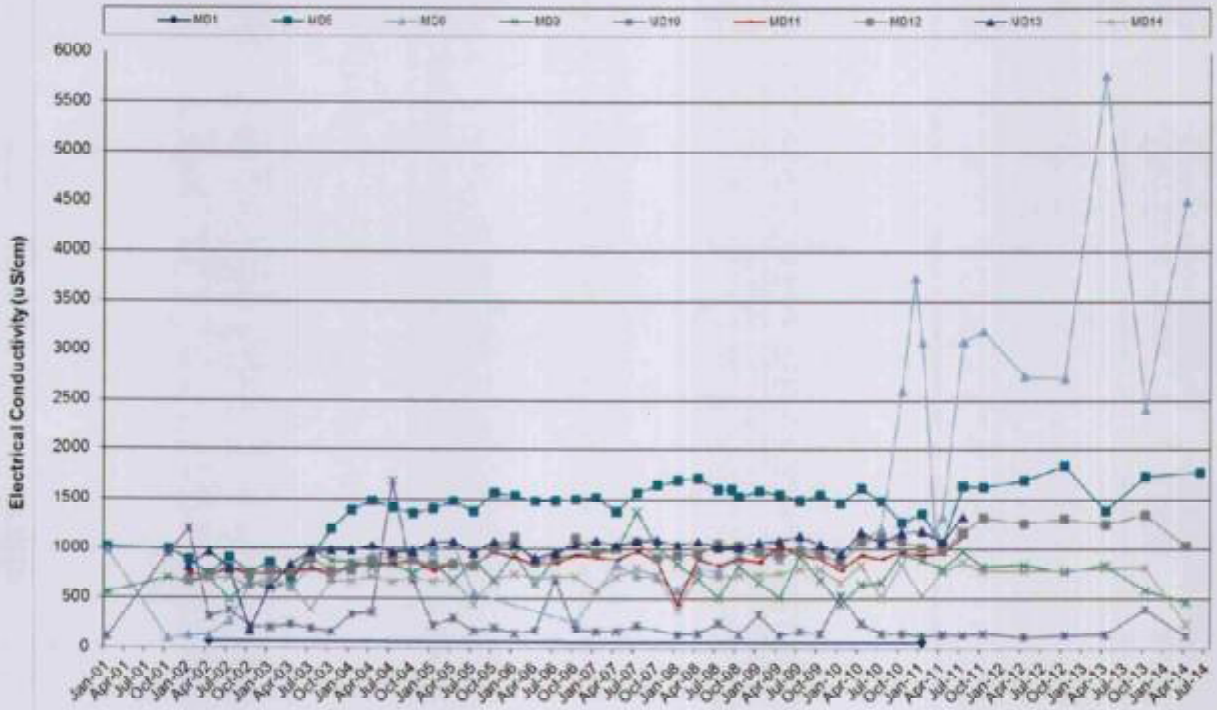

Figure 3: Groundwater EC – Lithgow Solid Waste Facility, January 2001 to June 2014

Total organic carbon (TOC) concentrations are presented in **Figure 4**.

Concentrations of TOC ranged from <1mg/L at MB14 to 39mg/L at MB6. Mean values ranged from 2.5mg/L at MB9 to 33mg/L at MB6. All concentrations measured during the reporting period were consistent with established ranges.

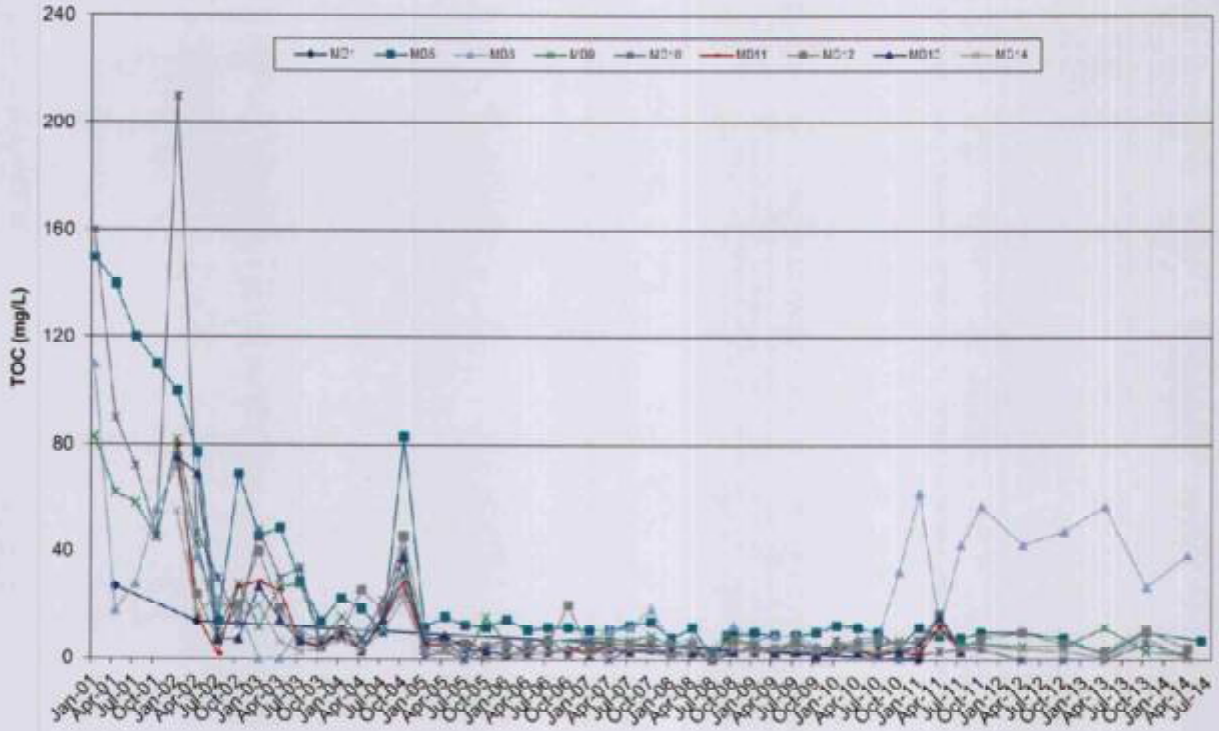

Figure 4: **Groundwater TOC – Lithgow Solid Waste Facility, January 2001 to June 2014**

Alkalinity concentrations are presented in **Figure 5**.

Mean concentrations of alkalinity for the reporting period ranged from 22mg/L at MB12 to 760mg/L at MB6. Individual alkalinity concentrations ranged from <1mg/L at MB12 to 854mg/L at MB6. New minimum values were recorded at MB9, MB10 and MB14. All other values recorded during the reporting period were consistent with established ranges. Both samples collected from MB6, as well as the October and June sample from MB5, and the October sample from MB14 exceeded the 350mg/L guideline value for irrigation to moderately tolerant crops (ANZECC & ARMCANZ, 2000).

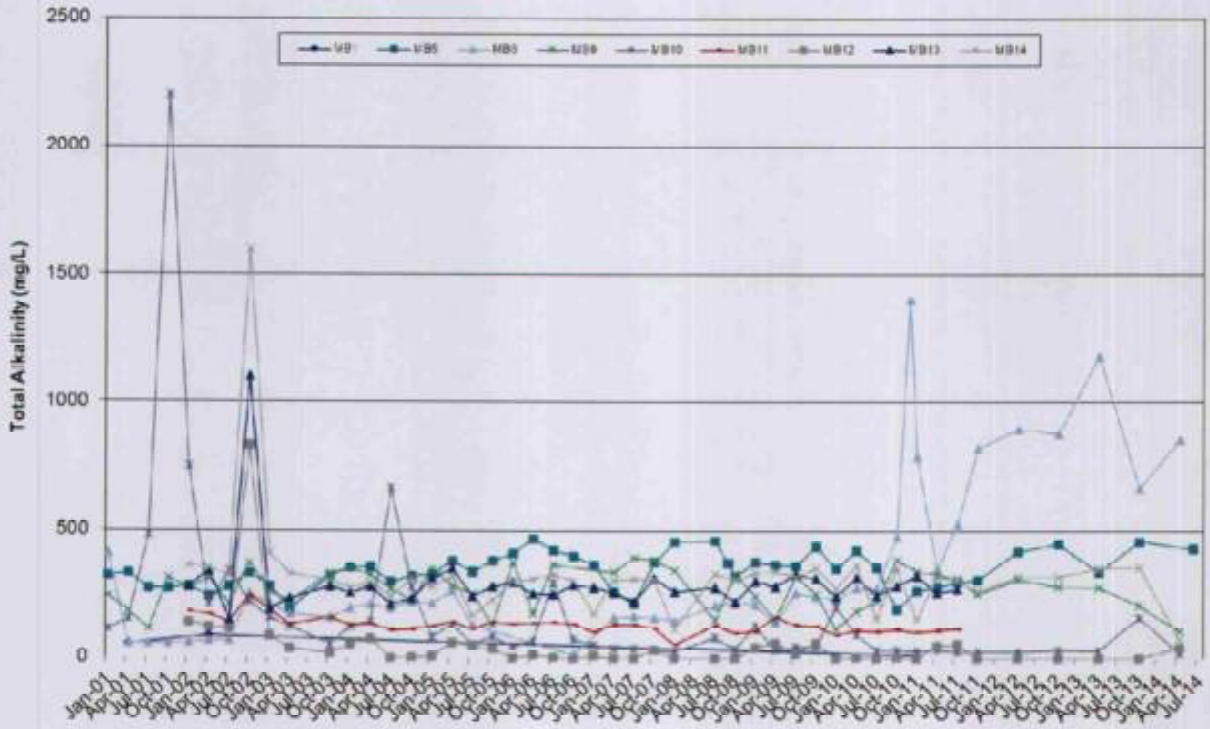

Figure 5: **Groundwater Alkalinity – Lithgow Solid Waste Facility, January 2001 to June 2014**

Exchangeable Ions

Chloride concentrations are presented in **Figure 6**.

Mean chloride concentrations of 264mg/L, 529mg/L, 52mg/L, 18mg/L, 269mg/L and 22mg/L were recorded at MB5, MB6, MB9, MB10, MB12 and MB14, respectively. A new minimum value was recorded at MB14 (8mg/L, April 2014).

All detected levels except the 702mg/L recorded at MB6 in April 2014 remained below the guideline value of 700mg/L for irrigation to moderately tolerant crops (ANZECC & ARMCANZ, 2000).

Figure 6: **Groundwater Chloride – Lithgow Solid Waste Facility, January 1999 to June 2014**

Sulfate concentrations are presented in **Figure 7**.

Mean concentrations of sulfate were 39mg/L (MB5), 149mg/L (MB6), 18mg/L (MB9), 9mg/L (MB10), 96mg/L (MB12) and 25mg/L (MB14). All concentrations recorded during the reporting period were consistent with established ranges, excepting the new minimum value recorded at MB14 (12mg/L, April 2014). The exception to this was a new minimum value observed at MB9 in October (5mg/L). All concentrations remained significantly lower than the livestock drinking water guideline value of 1000mg/L (ANZECC & ARMCANZ, 2000).

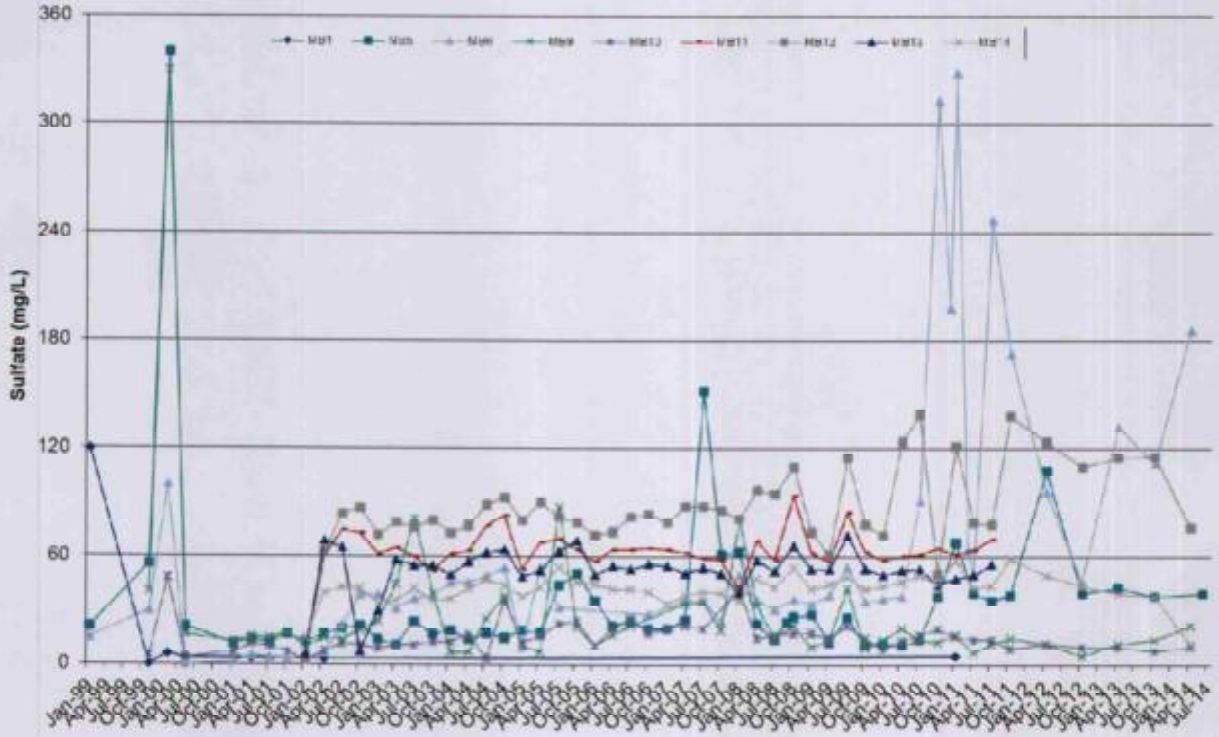

Figure 7: Groundwater Sulfate – Lithgow Solid Waste Facility, January 1999 to June 2014

Calcium concentrations are presented in **Figure 8**.

Mean concentrations of calcium were 119mg/L, 186mg/L, 24mg/L, 18mg/L, 26mg/L and 62mg/L at MB5, MB6, MB9, MB10, MB12 and MB14, respectively. A new minimum value was recorded at MB9 (18mg/L, April 2014), and a new maximum value was recorded at MB5 (130mg/L, June 2014). Calcium concentrations continue to be variable across the site, with MB6 notably the highest, but remaining significantly lower than the livestock drinking water guideline value of 1000mg/L (ANZECC & ARMCANZ, 2000).

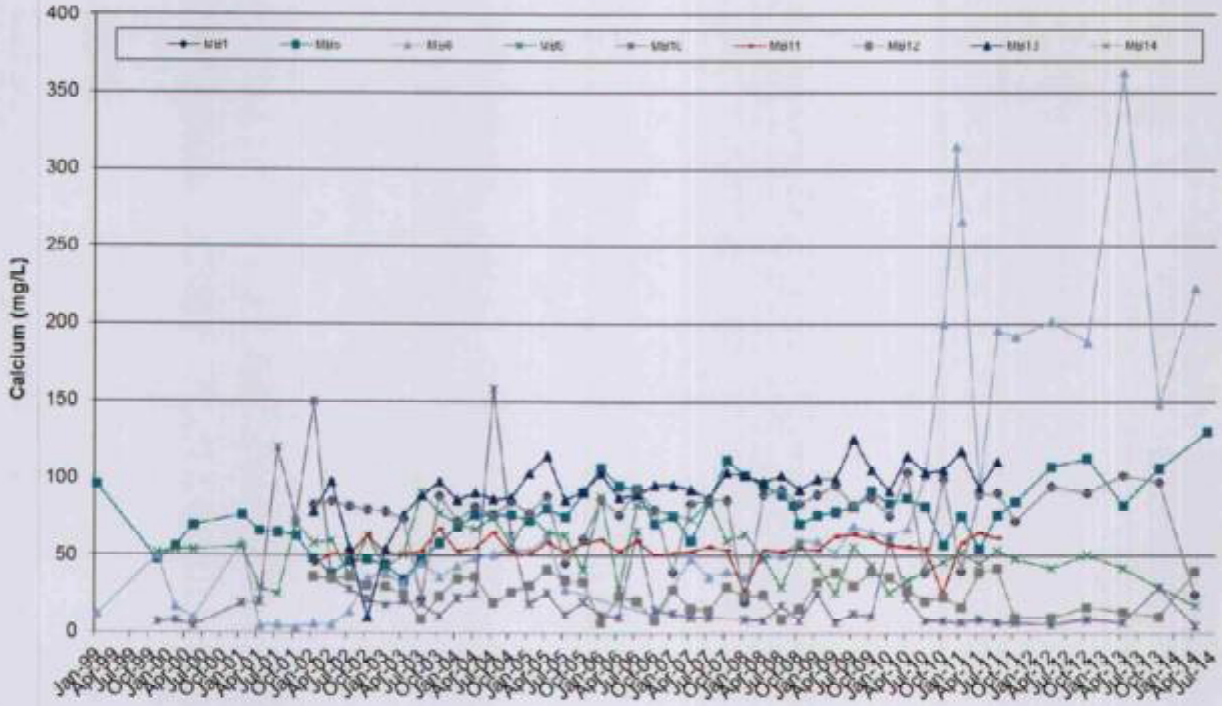

Figure 8: **Groundwater Calcium – Lithgow Solid Waste Facility, January 1999 to June 2014**

Magnesium concentrations are presented in **Figure 9**.

Mean concentrations of magnesium in groundwater samples were 37mg/L, 73mg/L, 14mg/L, 9mg/L, 22mg/L and 19mg/L at MB5, MB6, MB9, MB10, MB12 and MB14, respectively. All values were consistent with the established ranges, except the new minimum value recorded at MB14 (8mg/L, April 2014).

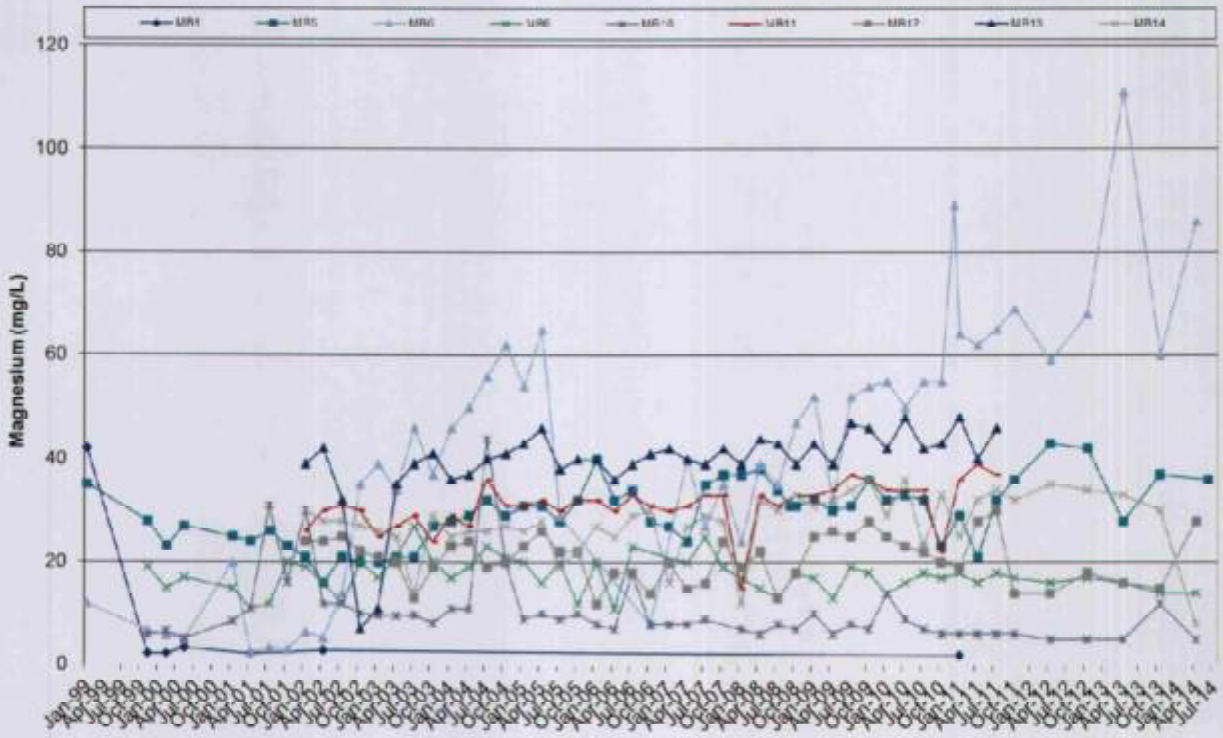

Figure 9: **Groundwater Magnesium – Lithgow Solid Waste Facility, January 1999 to June 2014**

Potassium concentrations are presented in **Figure 10**.

Mean potassium concentrations for the reporting period were 70mg/L (MB5), 122mg/L (MB6), 17mg/L (MB9), 6mg/L (MB10), 11mg/L (MB12) and 7mg/L (MB14). All values were consistent with established ranges, except the new minimum value recorded at MB14 (3mg/L, April 2014).

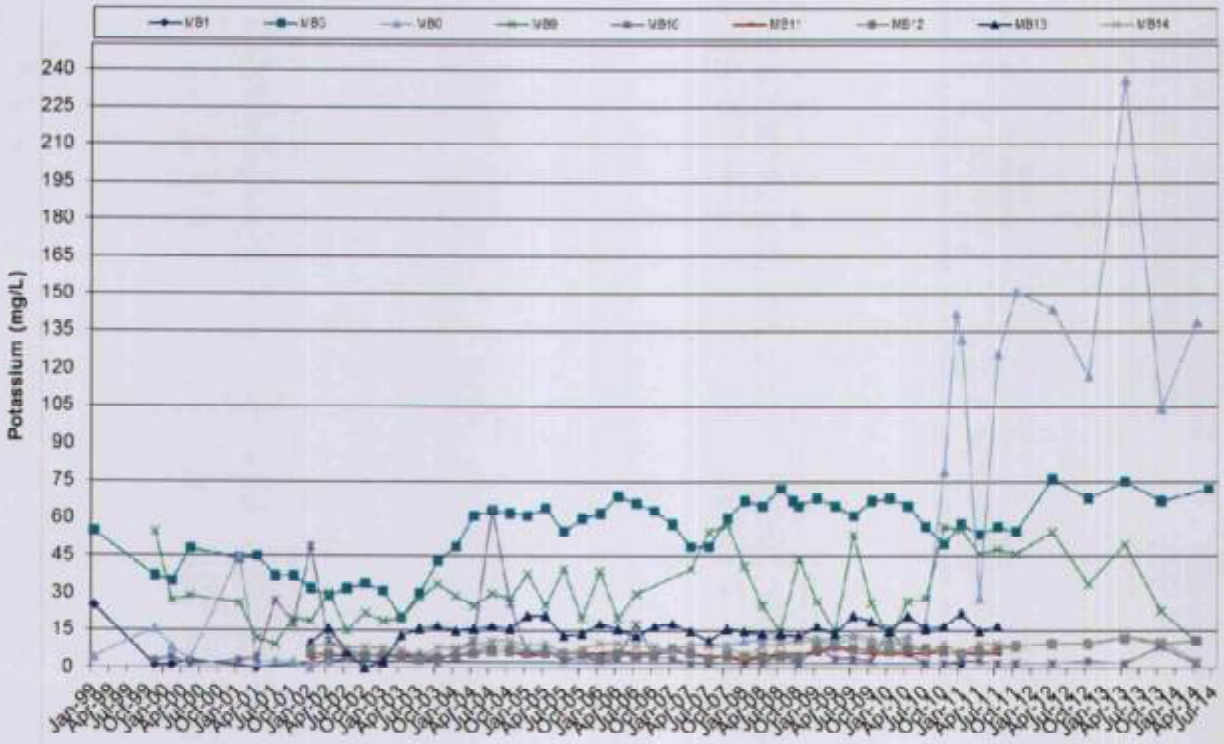

Figure 10: **Groundwater Potassium – Lithgow Solid Waste Facility, January 1999 to June 2014**

Sodium concentrations are presented in **Figure 11**.

Mean concentrations of sodium for the reporting period were 134mg/L (MB5), 335mg/L (MB6), 34mg/L (MB9), 12mg/L (MB10), 110mg/L (MB12) and 12mg/L (MB 14). All values were consistent with established ranges, except the new minimum value recorded at MB14 (6mg/L, April 2014). All values except the 462mg/L recorded at MB6 in April were below the irrigation guideline value for moderately tolerant crops (<460mg/L, ANZECC & ARMCANZ, 2000).

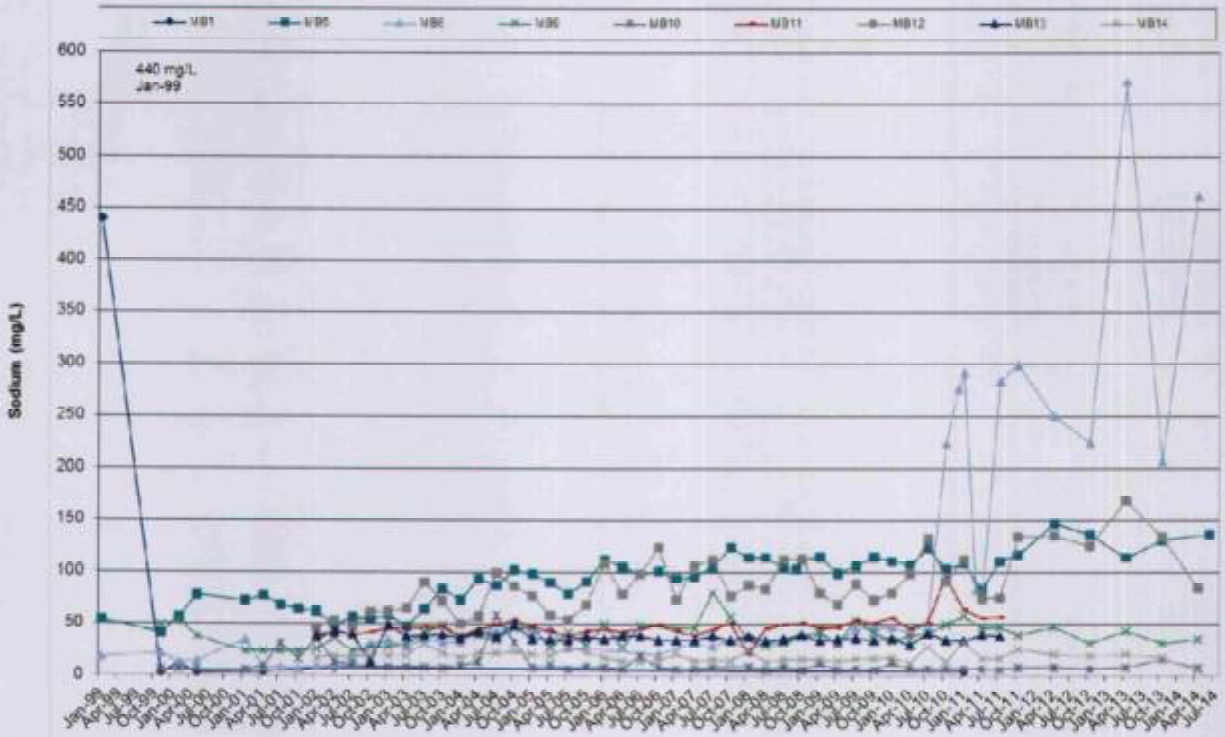

Figure 11: Groundwater Sodium – Lithgow Solid Waste Facility, January 1999 to June 2014

Nutrients

Ammonia concentrations are presented in **Figure 12**.

The maximum ammonia level recorded during the reporting period was 14.8mgN/L at MB5 in June 2014. All values were consistent with established ranges. Mean reporting period concentrations across the site were 11.5mgN/L, 1.6mgN/L, 4.5mgN/L, 2.4mgN/L, 3.8mgN/L and 0.16mgN/L at MB5, MB6, MB9, MB10, MB12 and MB14, respectively.

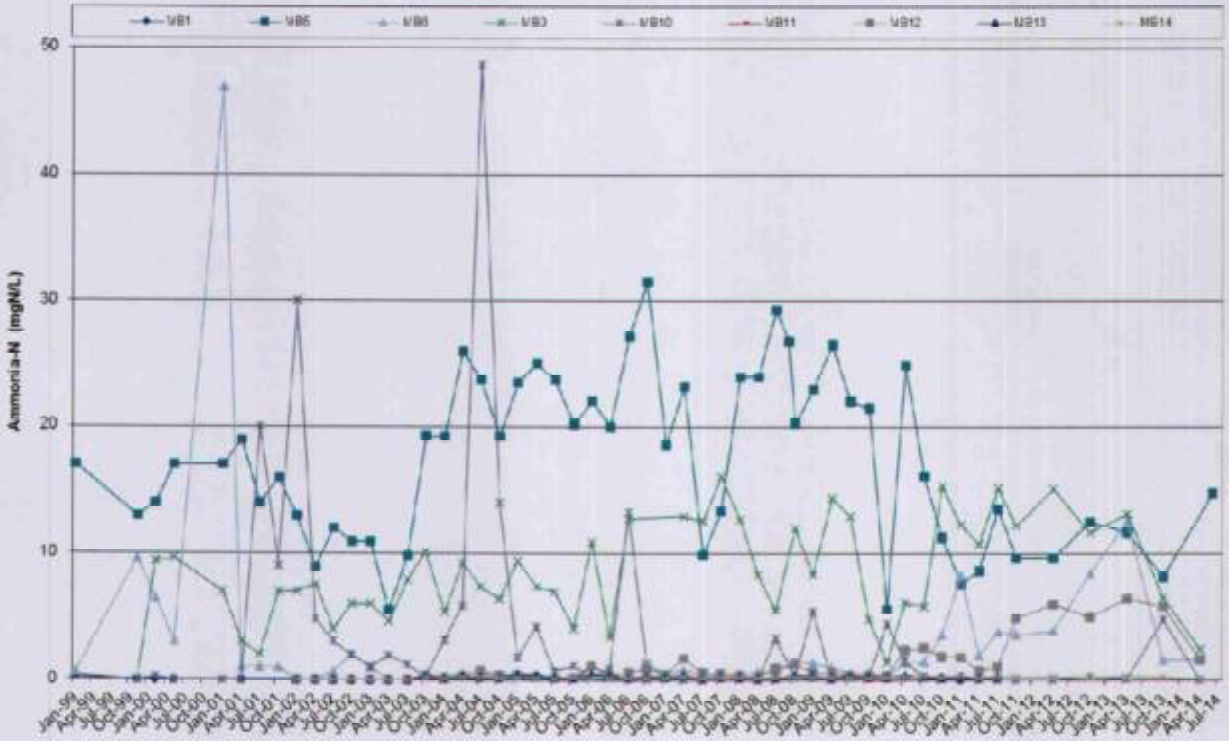

Figure 12: Groundwater Ammonia (as N) – Lithgow Solid Waste Facility, January 1999 to June 2014

Nitrate concentrations are presented in **Figure 13**.

Concentrations of nitrate remained relatively low, with the exception of MB5, which displayed a significant spike in April 2013 (18.1mgN/L), which was a new maximum value (an exceedance of 16.51mgN/L). All other values recorded during the reporting period were consistent with established ranges. All detected concentrations were significantly lower than the livestock drinking water guideline value of 90.29mgN/L (ANZECC & ARMCANZ, 2000). The mean concentration for each site was 9.50mgN/L, 0.09mgN/L, 0.06mgN/L, 0.22mgN/L, 0.03mgN/L and 0.17mgN/L at MB5, MB6, MB9, MB10, MB12 and MB14, respectively.

Monitoring of nitrate concentrations will continue at MB5 to identify the development of any adverse trend.

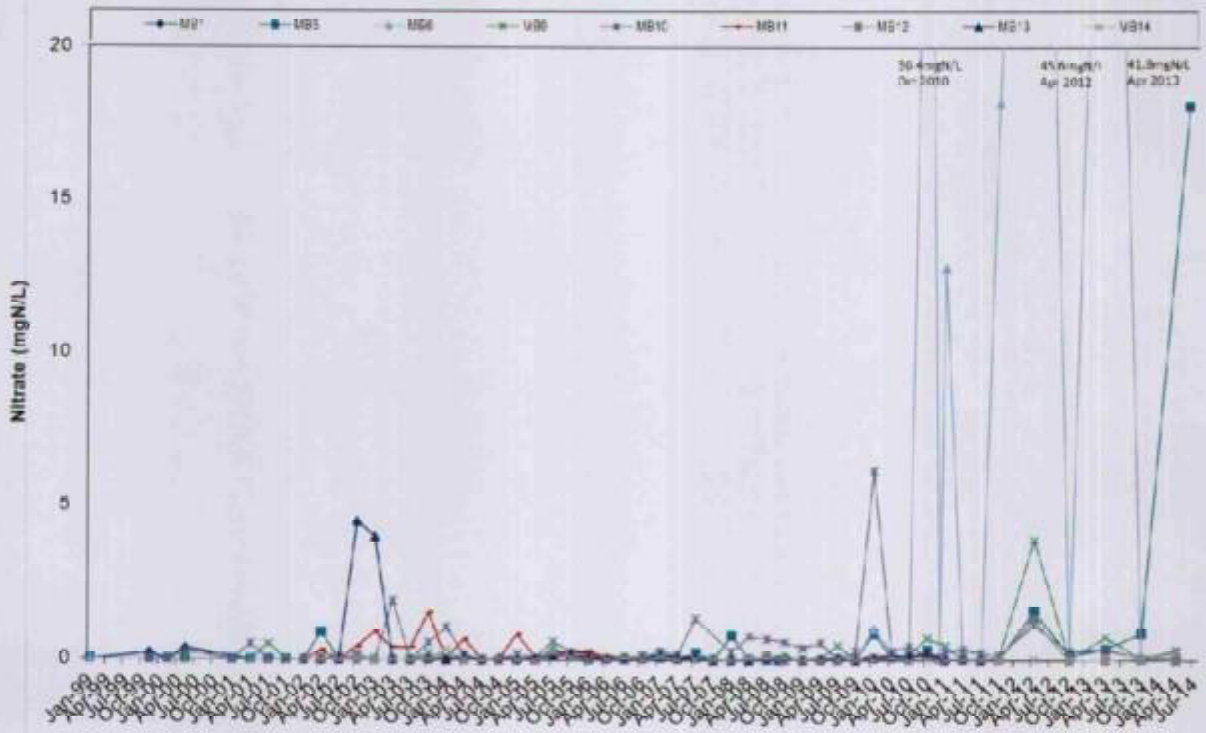

Figure 13: Groundwater Nitrate (as N) – Lithgow Solid Waste Facility, January 1999 to June 2014

Phosphate was recorded to be below the laboratory limit of reporting (<0.01mg/L) in all samples collected during the reporting period. Total phosphorus concentrations were all relatively low, ranging up to 0.42mg/L at MB6 in October. This concentration is considered suitable for crop irrigation for periods up to 20 years (ANZECC & ARMCANZ, 2000).

COD was introduced under the 4 October 2011 licence variation. COD concentrations ranged from below the LOR (<5mg/L, MB14, April 2014) to 140mg/L (MB6, April 2014).

Metals

Groundwater samples were analysed for a range of metals under EPL 6004; the results are discussed below.

Hexavalent chromium returned results below the laboratory limit of reporting (LOR, <0.01mg/L) in all samples collected. Total chromium was not detected at MB10 and MB14 during the report period (<0.001mg/L). Total Chromium was detected in all samples during the reporting period for MB6 (0.002mg/L). Total Chromium was only detected in MB9 and MB12 in October 2013, and in MB5 in June 2014. All results were consistent with established ranges for Total Chromium.

Aluminium ranged from below the LOR (<0.01mg/L, MB14, April 2014) to 14.5mg/L (MB12, October 2013). All concentrations were consistent with established ranges, except the new minimum value recorded at MB10 (0.02mg/L, April 2014). All except MB12 were below the 5mg/L guideline value for livestock drinking water and long-term irrigation (<20 years, ANZECC & ARMCANZ, 2000).

Manganese results ranged from 0.02mg/L at MB10 (April 2014) to 3.02mg/L at MB9 (October 2013). The mean concentration of each piezometer was 1.20mg/L, 2.095mg/L, 2.230mg/L, 0.122mg/L, 1.657mg/L and 0.061mg/L at MB5, MB6, MB9, MB10, MB12 and MB14, respectively. New minimum values were recorded at MB9 (1.44mg/L, April 2014) and MB14 (0.023mg/L). A new maximum value was recorded at MB12 (2.520mg/L, April 2014). All concentrations were considered suitable for crop irrigation for periods less than 20 years (<10mg/L, ANZECC & ARMCANZ, 2000).

Iron concentrations were variable between sites. Values ranged from below the LOR (<0.05mg/L) at MB14 in April 2014, to 39.8mg/L at MB12 in April 2014. The mean concentration of each monitoring station (MB5 through MB14) was 3.83mg/L, 23.02mg/L, 6.73mg/L, 1.06mg/L, 28.60mg/L and 0.91mg/L. The most notable individual site fluctuations were observed at MB6, MB9 and MB12. All concentrations were consistent with established ranges. Natural dissolution of iron and manganese from the sandstone beneath the site was identified in a hydrogeological study by Jewell and Associates (2001) which is likely to be the origin of this fluctuation and is not cause for concern.

Analysis of magnesium has been presented earlier in the section.

Organics

Groundwater samples were analysed for total petroleum hydrocarbons (TPH). TPH were not detected at any monitoring point in the October 2013 monitoring round but were detected at MB6 and MB12 in April 2014, and at MB5 in June 2014. Detected fractions were consistent with historical ranges in all instances.

Total phenols concentrations were below the laboratory limit of reporting (<0.05mg/L) at all monitoring stations sampled throughout the reporting period. This is consistent with the established ranges of the sites.

Organochlorine and organophosphorus pesticide (OCP and OPP) concentrations were below the laboratory limit of reporting at all groundwater monitoring stations.

3.2.3 RESULTS FOR MB6

MB6 has shown significant fluctuations in a number of parameters over the past three and a half years to April 2014, and is thought to be caused by surface water ingress. This piezometer is located up-gradient of the landfill area and within a surface water diversion drain. Approximately four years ago the landfill area was extended to allow an access road to be constructed, which resulted in fill being moved into close proximity of the piezometer. This fill batter and drain often contains quantities of litter from the landfill operations.

Works to limit surface water ingress to MB6 as recommended in the 2012 AEMR were undertaken in June 2013. Despite these works resulting in a decrease in MB6 water levels and decreases in several groundwater quality parameters from April 2013 to October 2014, an increase in MB6 water levels between October 2014 and April 2014, coincides with increases in several groundwater quality parameters (including pH, EC, TOC, alkalinity, chloride, sulfate, calcium, magnesium, potassium and sodium). This indicates that surface water ingress to the piezometer annulus (i.e. surface water entering the hole drilled to house the piezometer tube) may still be occurring. MB6 will continue to be monitored to identify the development of any adverse trend.

3.3 SURFACE WATER

Surface water monitoring consists of a single monitoring point SW1, which (since the 4 September 2013 licence variation) is required to be sampled monthly during discharge. The location of the monitoring point is illustrated in **Drawing 01B_EV04**. SW1 was only discharging at the time of sampling in April 2014.

3.3.1 QUALITY

Chemical Properties

pH concentrations are presented in **Figure 14**.

pH remained consistent with historical results and within the established range, with a value of 7.32pH units recorded. This value is considered suitable for consumption by livestock (ANZECC & ARMCANZ, 2000) and were within the EPL limit of 6.5-8.5pH units.

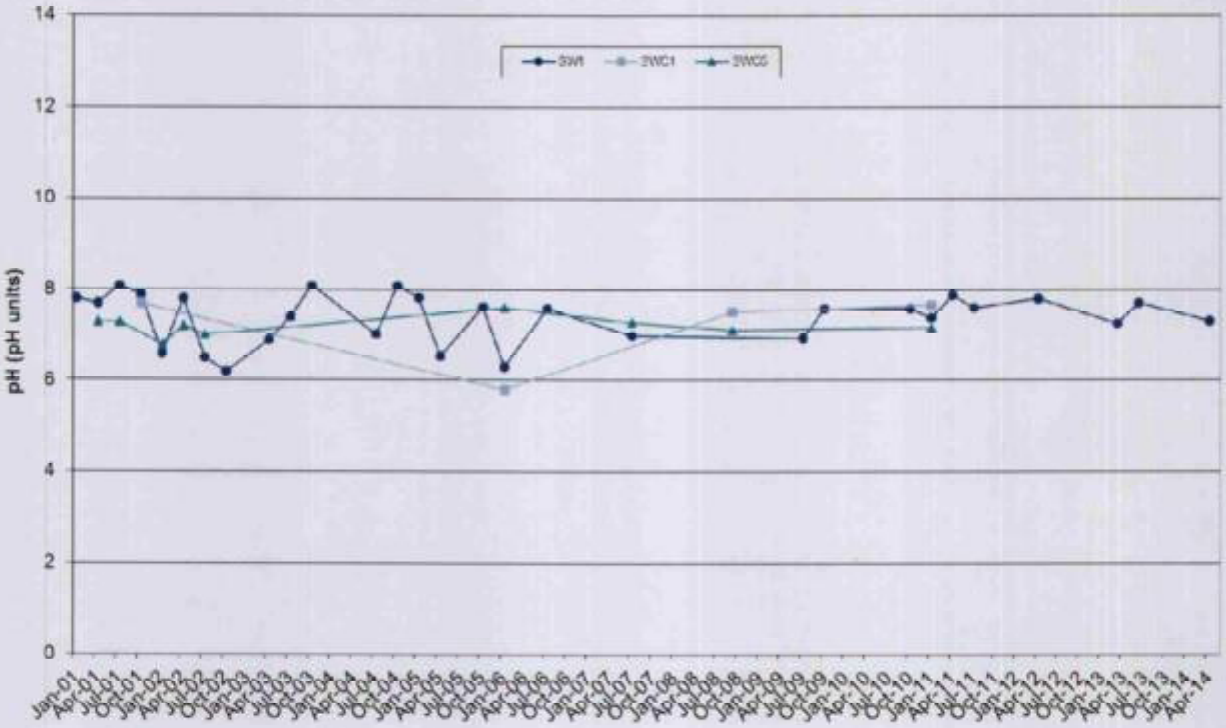

Figure 14: Surface water pH – Lithgow Solid Waste Facility, January 2001 to April 2014

Electrical conductivity concentrations are presented in **Figure 15**.

Electrical conductivity was measured to be 154µS/cm in April 2014, which was consistent with historical data and suitable for consumption by livestock (ANZECC & ARMCANZ, 2000).

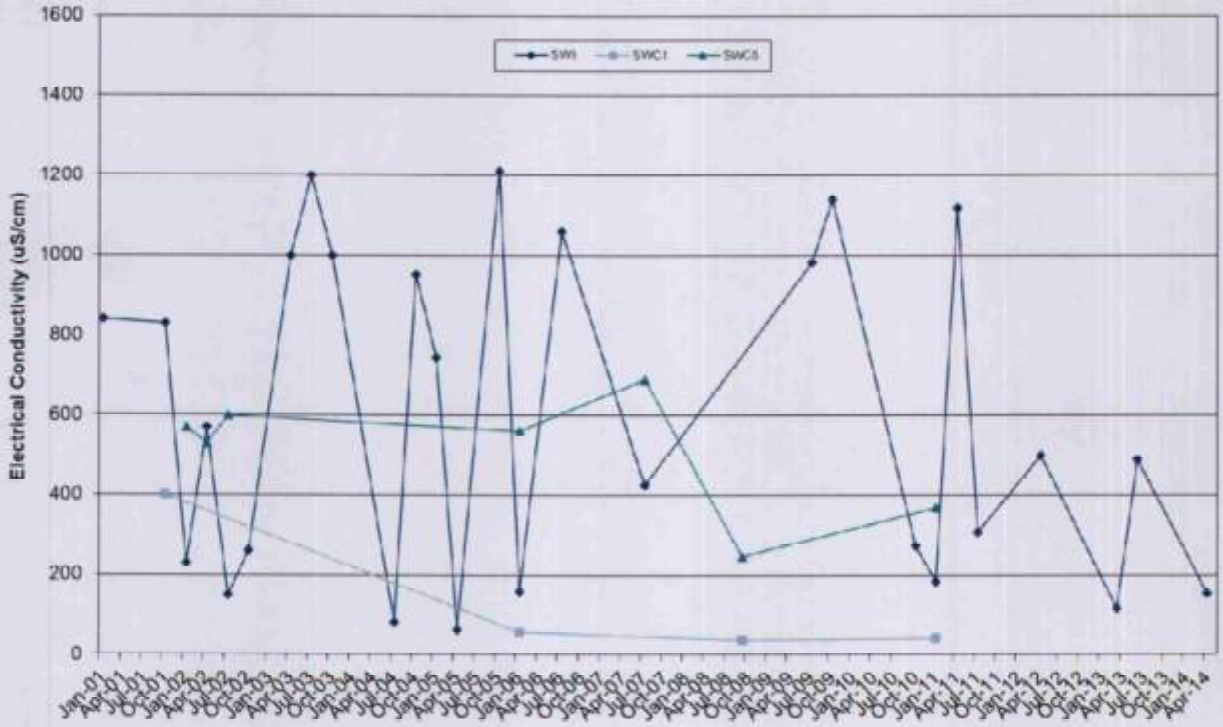

Figure 15: Surface water electrical conductivity – Lithgow Solid Waste Facility, January 2001 to April 2014

TOC concentrations are presented in **Figure 16**.

Total organic carbon was measured to be 3mg/L in April 2014, which was consistent with the historical range.

Figure 16: Surface water TOC – Lithgow Solid Waste Facility, January 2001 to April 2014

Chloride concentrations are presented in **Figure 17**.

Chloride was observed to be 12mg/L, which was consistent with the historical range of the monitoring point and below the guideline value of 700mg/L recommended for irrigation to moderately tolerant crops (ANZECC & ARMCANZ, 2000).

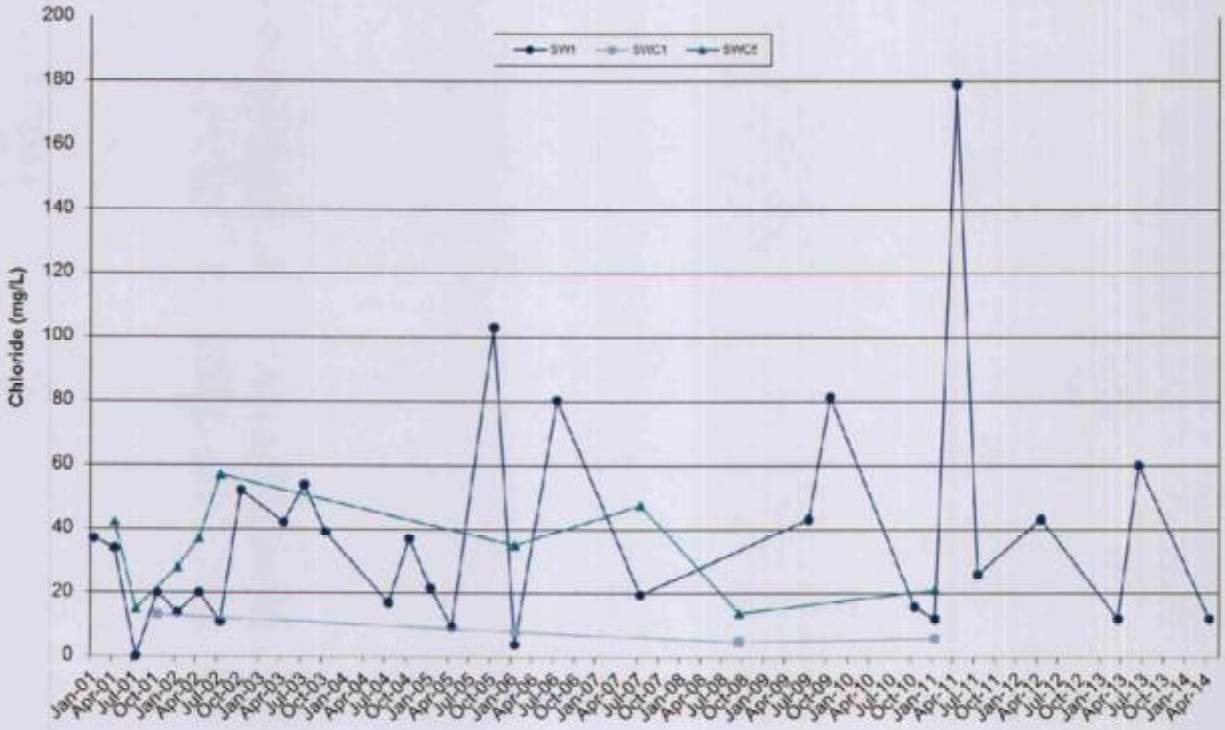

Figure 17: Surface water chloride – Lithgow Solid Waste Facility, January 2001 to April 2014

Sulfate concentrations are presented in **Figure 18**.

Sulfate was measured to be 13mg/L, which was consistent with the established range and significantly lower than the 1000mg/L recommended for livestock drinking water (ANZECC & ARMCANZ, 2000).

Figure 18: Surface water sulfate – Lithgow Solid Waste Facility, January 2001 to April 2014

Calcium concentrations are presented in **Figure 19**.

Calcium was measured to be 9mg/L, which is consistent with the established range and is significantly lower than the 1000mg/L livestock drinking water guideline (ANZECC & ARMCANZ, 2000)

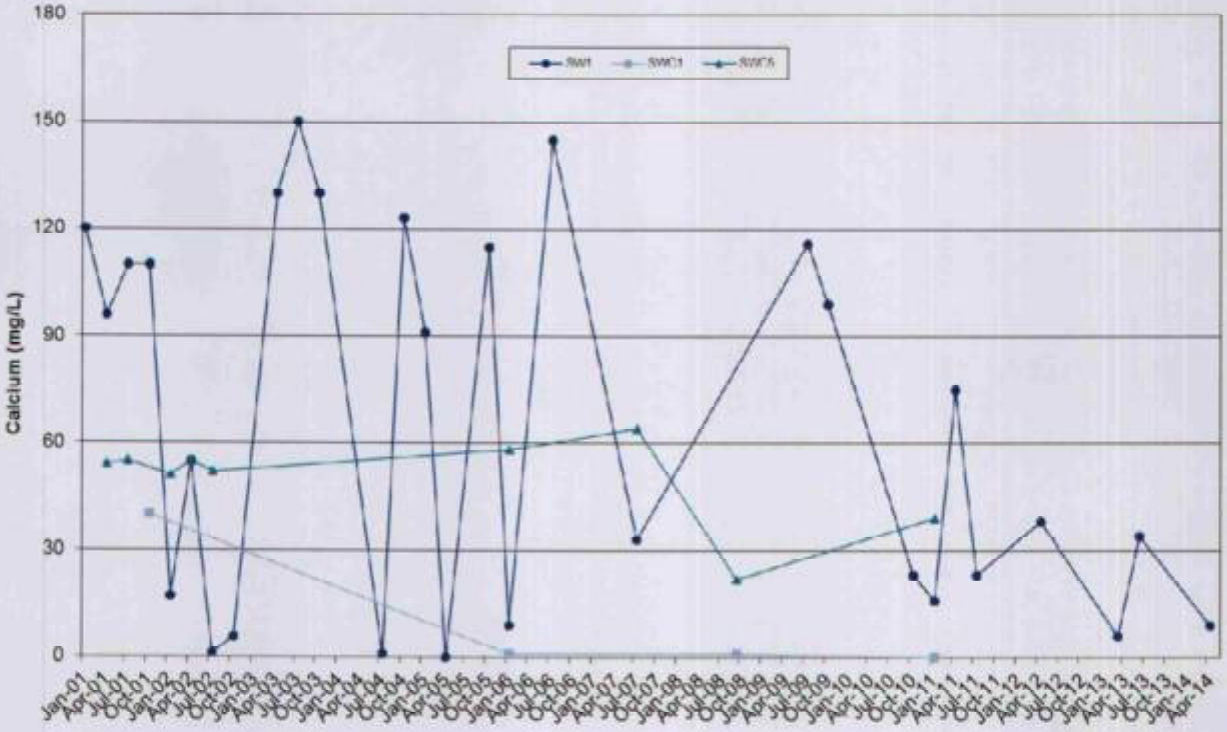

Figure 19: Surface water calcium – Lithgow Solid Waste Facility, January 2001 to April 2014

Magnesium concentrations are presented in **Figure 20**.

Magnesium was measured to be 4mg/L, which was consistent with the established range.

Figure 20: **Surface water magnesium – Lithgow Solid Waste Facility, January 2001 to April 2014**

Potassium concentrations are presented in **Figure 21**.

The potassium concentrations recorded was 6mg/L, which was again consistent with the historical range.

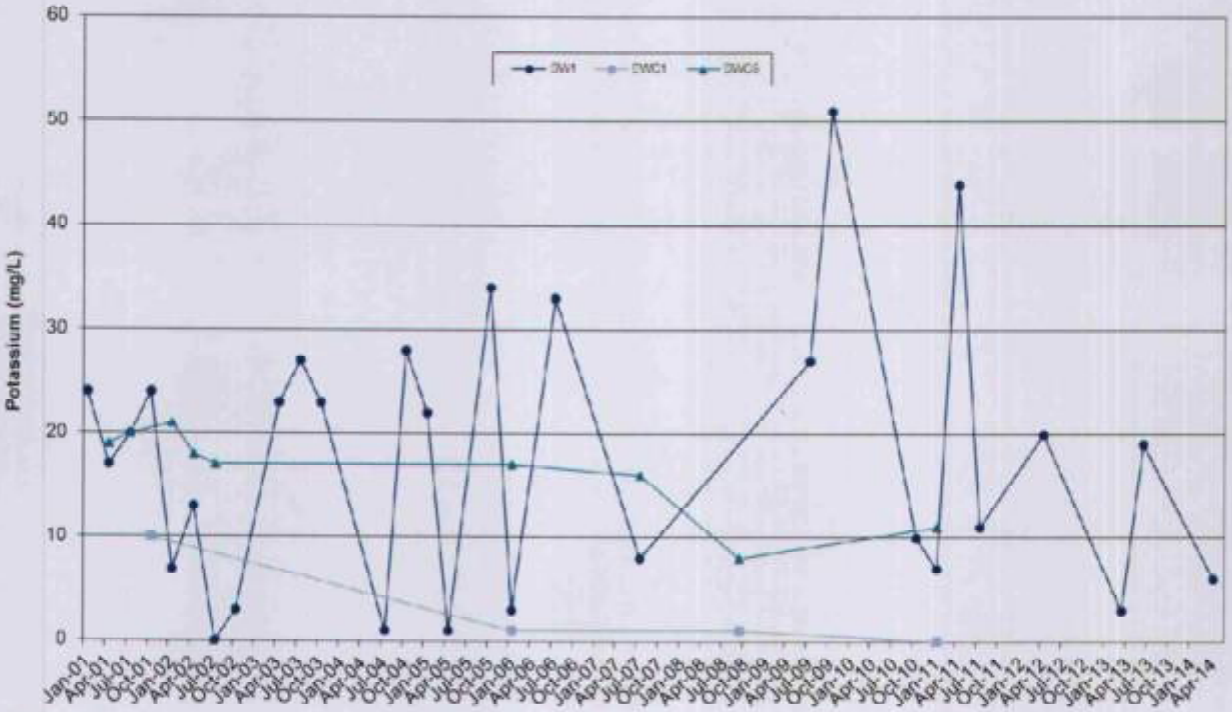

Figure 21: **Surface water potassium – Lithgow Solid Waste Facility, January 2001 to April 2014**

Sodium concentrations are presented in **Figure 22**.

The sodium concentration in April 2014 was measured to be 12mg/L, which is consistent with the established range and significantly lower than the crop irrigation guideline value of 460mg/L for moderately tolerant crops (ANZECC & ARMCANZ, 2000).

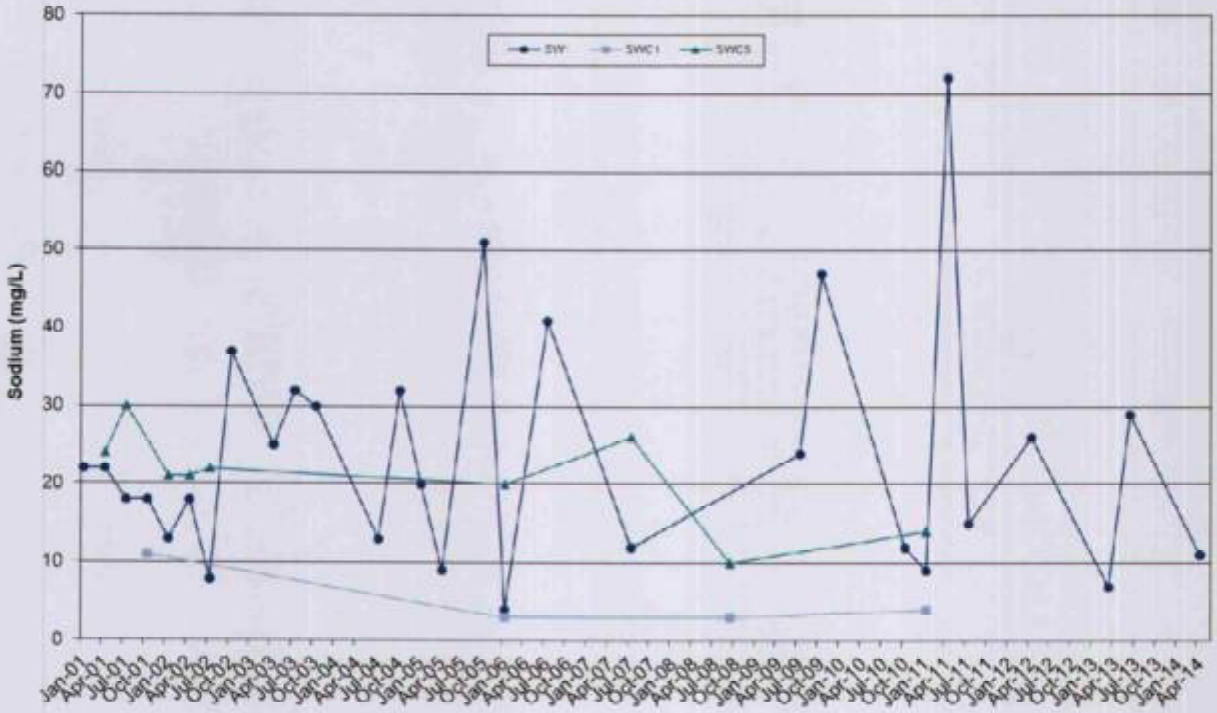

Figure 22: Surface water sodium – Lithgow Solid Waste Facility, January 2001 to April 2014

Ammonia concentrations are presented in **Figure 23**.

The ammonia concentration in April 2014 was measured to be 0.12mgN/L, a significant decrease from the June 2013 monitoring round. The April 2014 ammonia concentration is consistent with the established range and is significantly below the guideline value for livestock drinking water (9.12mgN/L, ANZECC & ARMCANZ, 2000).

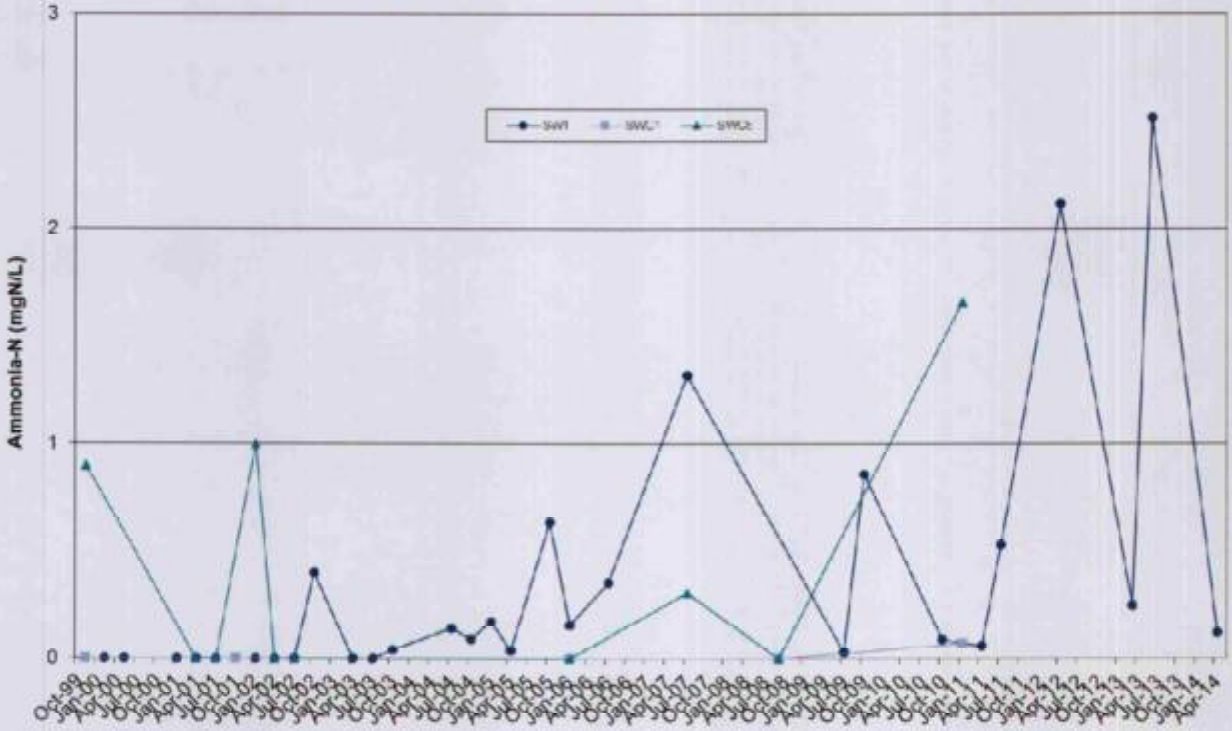

Figure 23: Surface water ammonia – Lithgow Solid Waste Facility, October 1999 to April 2014

Nitrate concentrations are presented in **Figure 24**.

At 0.02mgN/L, nitrate in April 2014 remained significantly lower than the livestock drinking water guideline value of 90.29mgN/L (ANZECC & ARMCANZ, 2000), and was consistent with the established range.

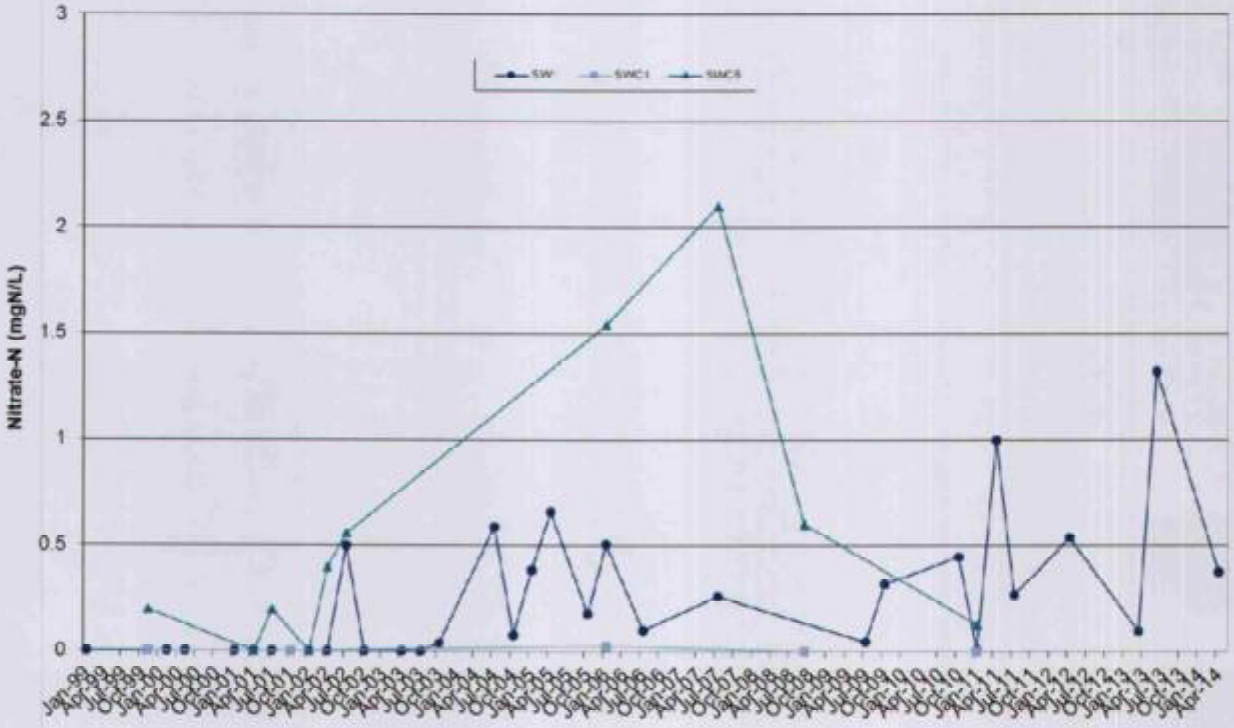

Figure 24: **Surface water nitrate – Lithgow Solid Waste Facility, January 1999 to April 2014**

Alkalinity concentrations are presented in **Figure 25**.

Alkalinity was measured to be 33mg/L, which is consistent with the established range and below the 350mg/L recommended for crop irrigation (ANZECC & ARMCANZ, 2000).

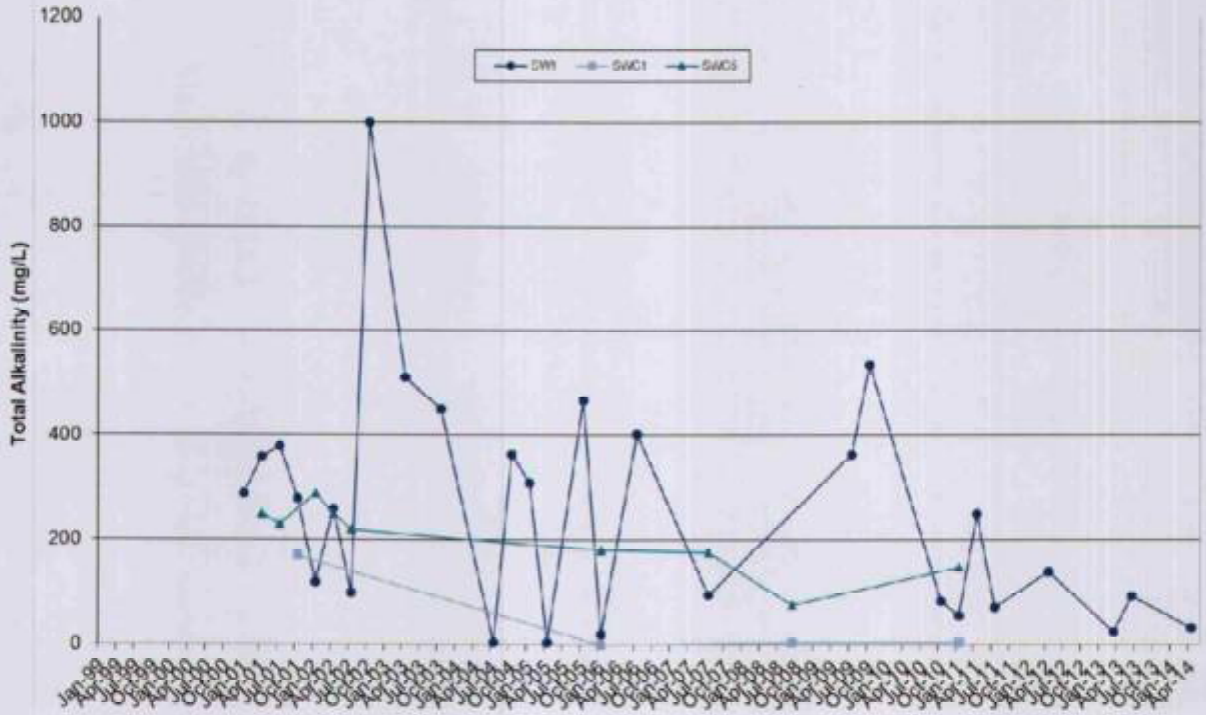

Figure 25: Surface water alkalinity – Lithgow Solid Waste Facility, January 1999 to April 2014

Fluoride was below the laboratory limit of reporting (<0.1mg/L) in April, which is consistent with historical data.

Iron and manganese were both consistent with historical results at 1.37mg/L and 0.042mg/L, respectively. Both metals were also below the guideline limits for short-term crop irrigation (ANZECC & ARMCANZ, 2000).

Total petroleum hydrocarbon fractions were not detected.

Organochlorine and organophosphorus pesticide (OCP and OPP) concentrations were below the laboratory limit of reporting.

Total phenols were not detected (<0.05mg/L).

Chemical oxygen demand was measured to be 12mg/L. This is the second reporting period in which COD was analysed, and the result is a new minimum value.

Total phosphorus was measured to be 0.04mg/L. This is the second reporting period in which phosphorus was analysed, and is within the range of values established thus far (<0.01mg/L to 0.29mg/L).

Total suspended solids were measured to be 16mg/L in April 2014, which is below the EPL limit of 30mg/L, and consistent with the established range of the monitoring point. The April 2014 TOC result is a significant and favourable decrease from the June 2014 TOC concentration of 367mg/L.

Aluminium was measured to be 1.25mg/L in April 2014, which is consistent with the established range and below the livestock drinking water guideline value of 5mg/L (ANZECC & ARMCANZ, 2000). The April 2014 aluminium concentration is a favourable decrease from the June 2013 aluminium concentration of 6.75mg/L which exceeded the guideline value.

Hexavalent chromium and Total Chromium were not detected (<0.01mg/L, <0.001mg/L respectively). Both values were consistent with historical results.

3.4 LEACHATE

Leachate monitoring was undertaken biannually during the reporting period at EPL monitoring point 9 (LW1, refer **Drawing 01B_EV04**). No sample could be obtained in the October 2013 monitoring round as the leachate point was dry at the time of monitoring. Total Phenols were not analysed in the April 2014 monitoring round but was analysed in a sample collected in June 2014.

3.4.1 QUALITY

Chemical Properties

pH measurements are presented in **Figure 26**

pH levels in the sample collected from LW1 was 7.74pH units. The value was relatively neutral and within the guideline range recommended for livestock drinking water (6.5-8.5pH units, ANZECC & ARMCANZ, 2000). The value was also within the established historical range.

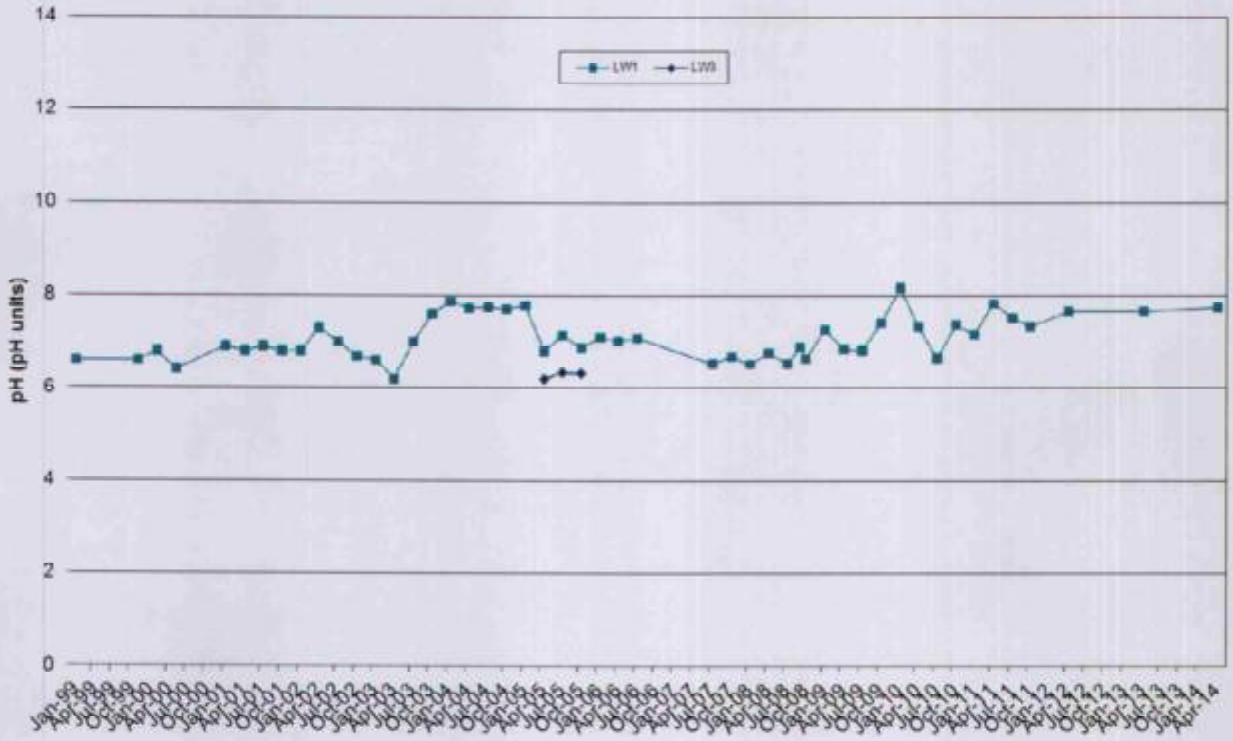

Figure 26: Leachate pH – Lithgow Solid Waste Facility, January 1999 to April 2014

Electrical Conductivity levels are presented in **Figure 27**.

The *field measured* EC level recorded in April 2014 was 1697µS/cm, which was consistent with the *field measured* historical range and was low when compared to the guideline value for the most susceptible livestock category, poultry (3100µS/cm, ANZECC & ARMCANZ, 2000). It is noted that the April 2013 and April 2014 values graphed above is a field measurement, where previous data presented was laboratory measured, which may account for some variation.

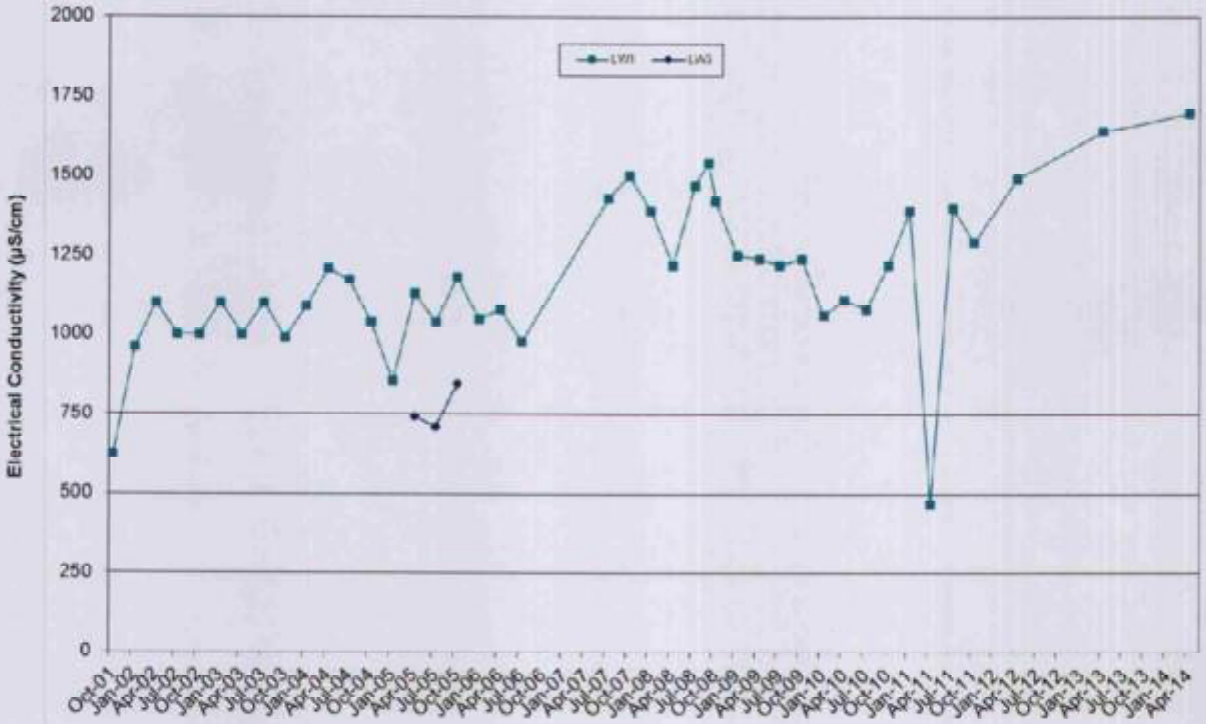

Figure 27: **Leachate EC – Lithgow Solid Waste Facility, October 2001 to April 2014**

Total organic carbon (TOC) concentrations are presented in **Figure 28**.

TOC at LW1 remained consistent with the established range at 6mg/L.

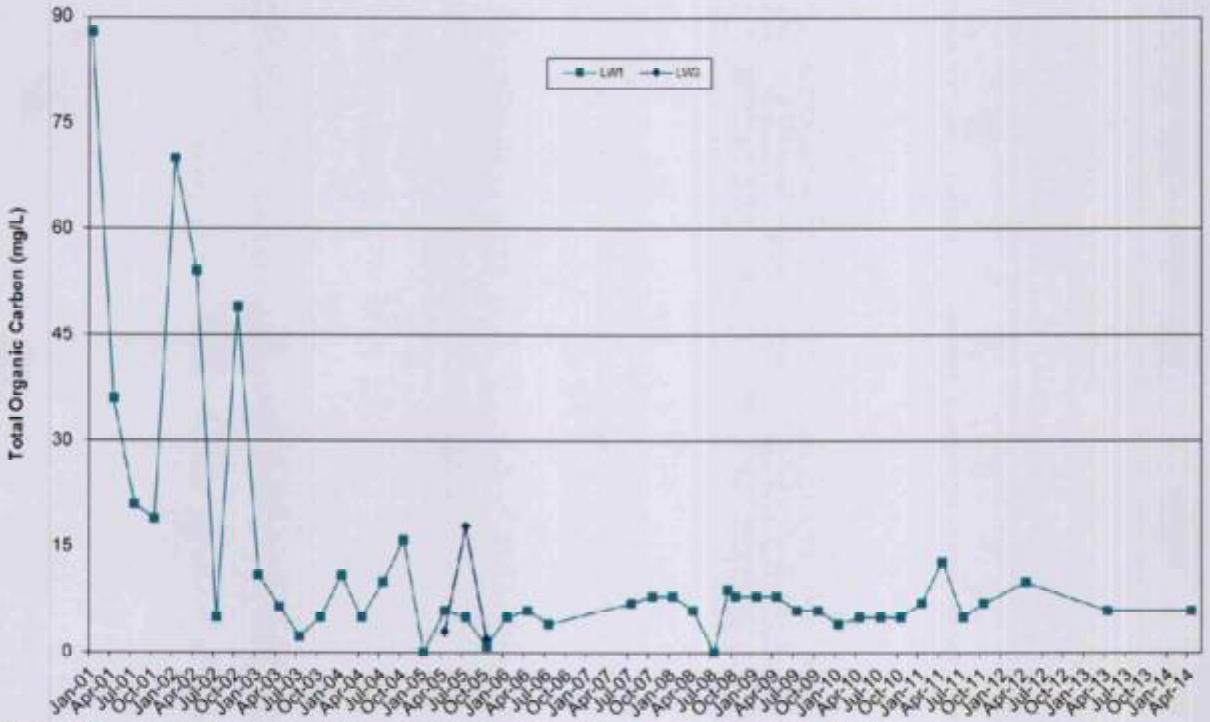

Figure 28: **Leachate TOC – Lithgow Solid Waste Facility, January 2001 to April 2014**

Total alkalinity concentrations are presented in **Figure 29**.

Total alkalinity remained relatively consistent at 227mg/L, and did not exceed the crop irrigation guideline for moderately tolerant crops (350mg/L, ANZECC & ARMCANZ, 2000).

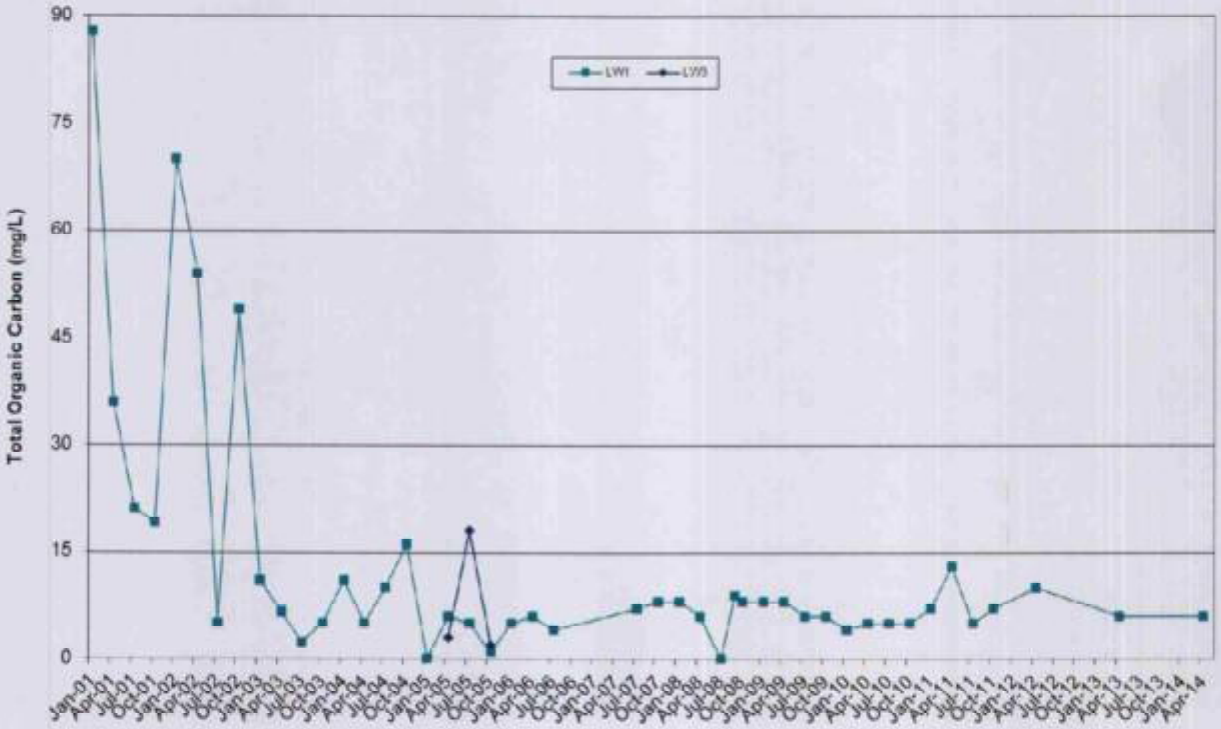

Figure 29: **Leachate Total Alkalinity – Lithgow Solid Waste Facility, January 2001 to April 2014**

Exchangeable Ions

Biannual **calcium**, **magnesium**, **potassium** and **sodium** concentrations are presented in **Figure 30**, **Figure** 31, **Figure** 32, and **Figure** 33 respectively.

The calcium, magnesium, potassium and sodium concentrations recorded at monitoring station LW1 were 87mg/L, 36mg/L, 48mg/L and 106mg/L respectively. All values were consistent with the established ranges.

Calcium remains significantly lower than the livestock drinking water guideline value of 1000mg/L (ANZECC & ARMCANZ, 2000). Sodium concentrations are considered low when compared to the crop irrigation guideline value of <460mg/L (ANZECC & ARMCANZ, 2000).

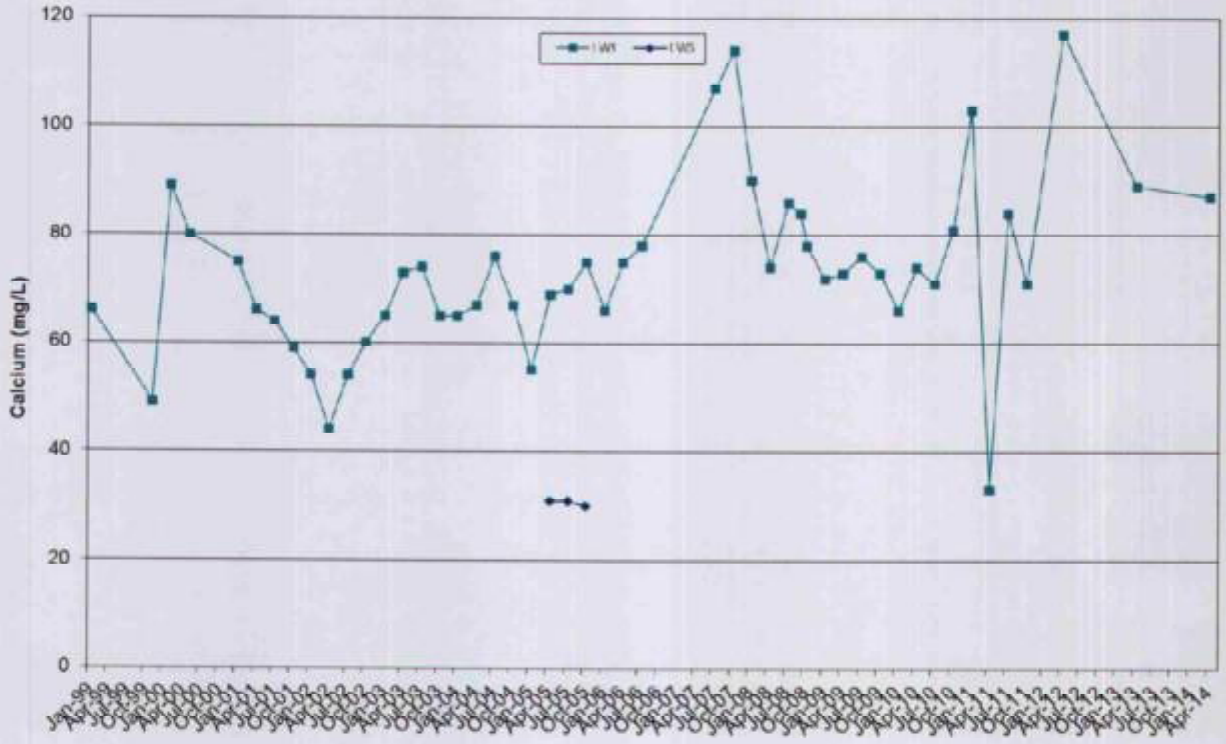

Figure 30: **Leachate Calcium concentrations – Lithgow Solid Waste Facility, January 1999 to April 2014**

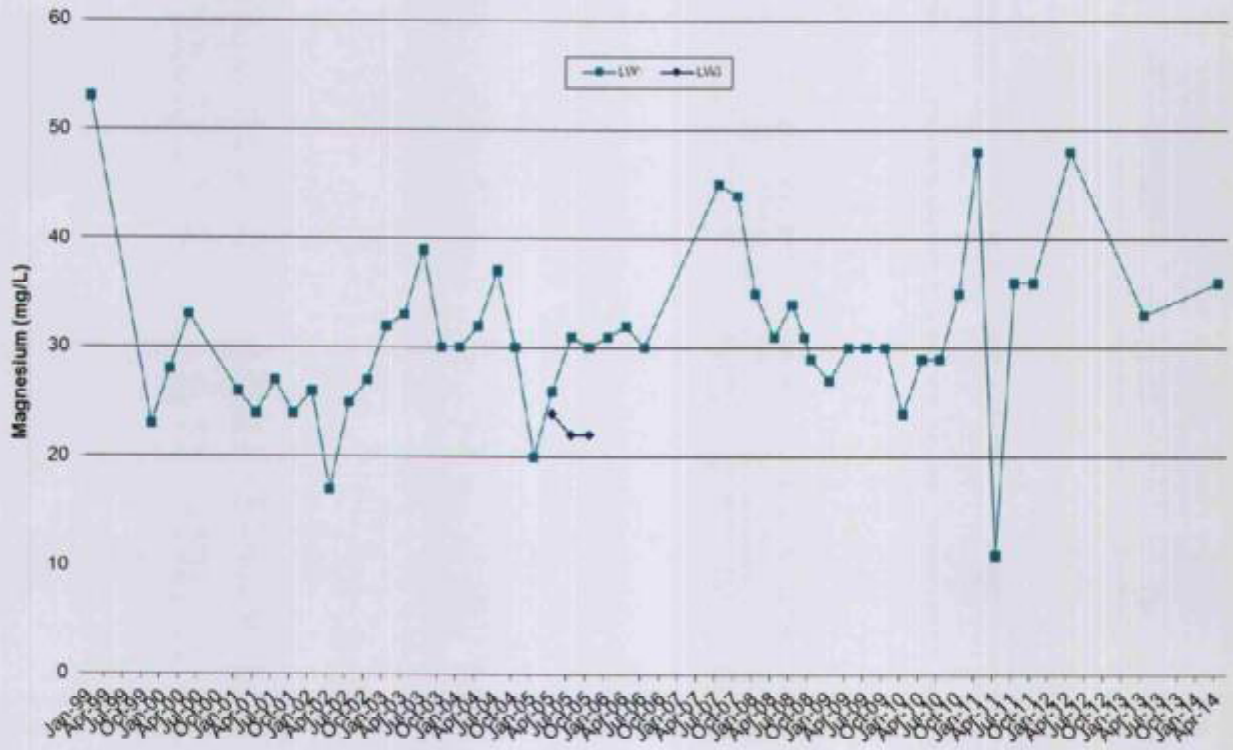

Figure 31: Leachate Magnesium concentrations – Lithgow Solid Waste Facility, January 1999 to April 2014

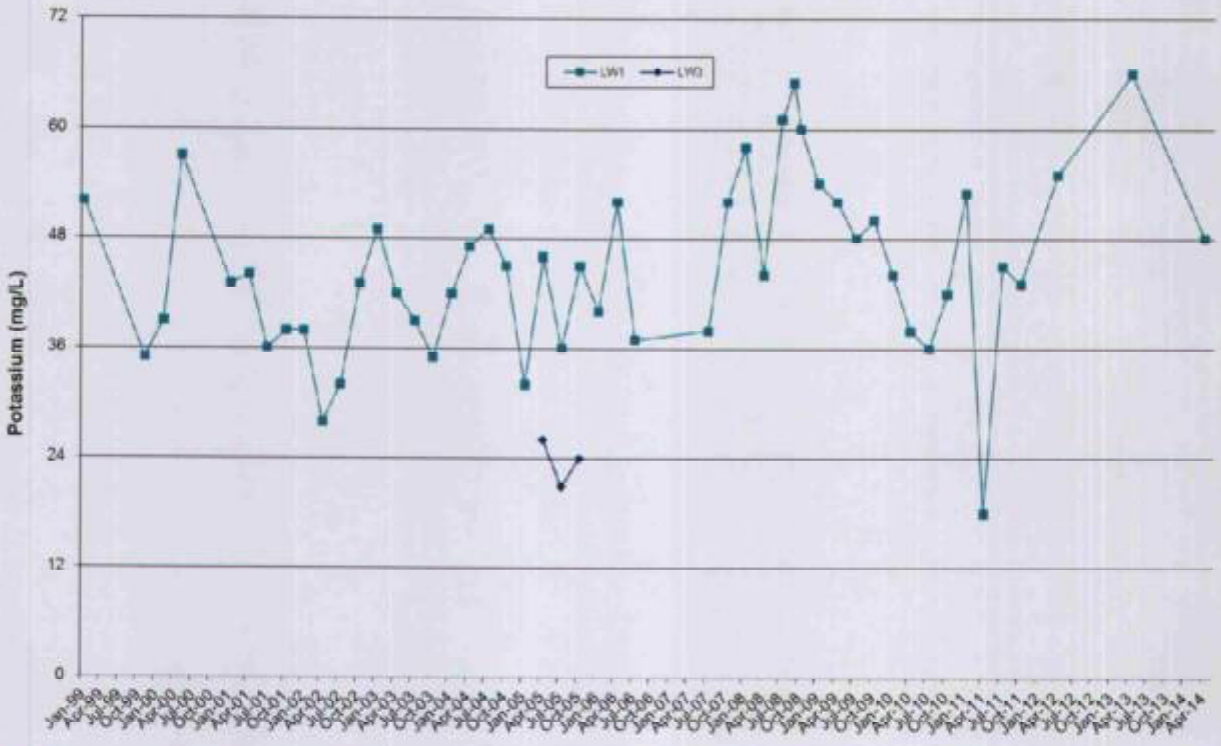

Figure 32: Leachate Potassium concentrations – Lithgow Solid Waste Facility, January 1999 to April 2014

Figure 33: **Leachate Sodium concentrations – Lithgow Solid Waste Facility, January 1999 to August 2013**

Chloride and **sulfate** concentrations are presented in **Figure 34** and **Figure 35** respectively.

Chloride and sulfate concentrations detected during the reporting period at monitoring station LW1 were 266mg/L and 30mg/L, respectively. Since the previous monitoring round, the sulfate concentration decreased and the chloride concentration increased to a new maximum value. Concentrations were lower than livestock drinking water and crop irrigation guidelines (ANZECC & ARMCANZ, 2000).

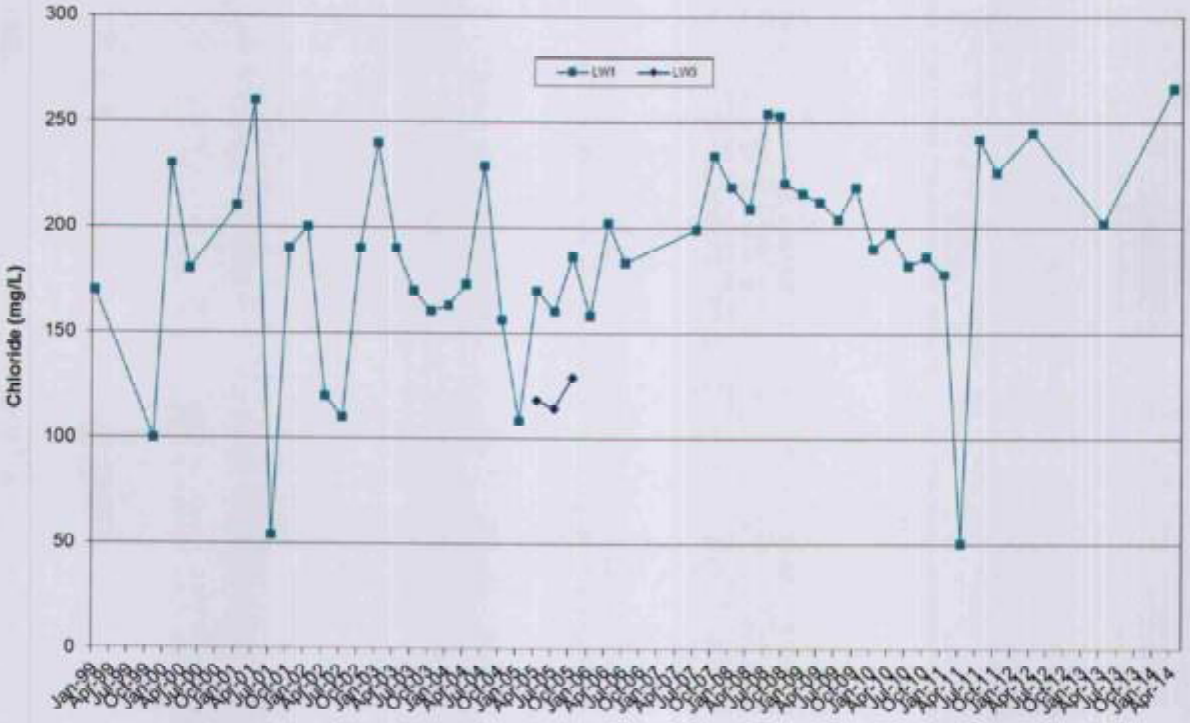

Figure 34: **Leachate Chloride concentrations – Lithgow Solid Waste Facility, January 1999 to April 2014**

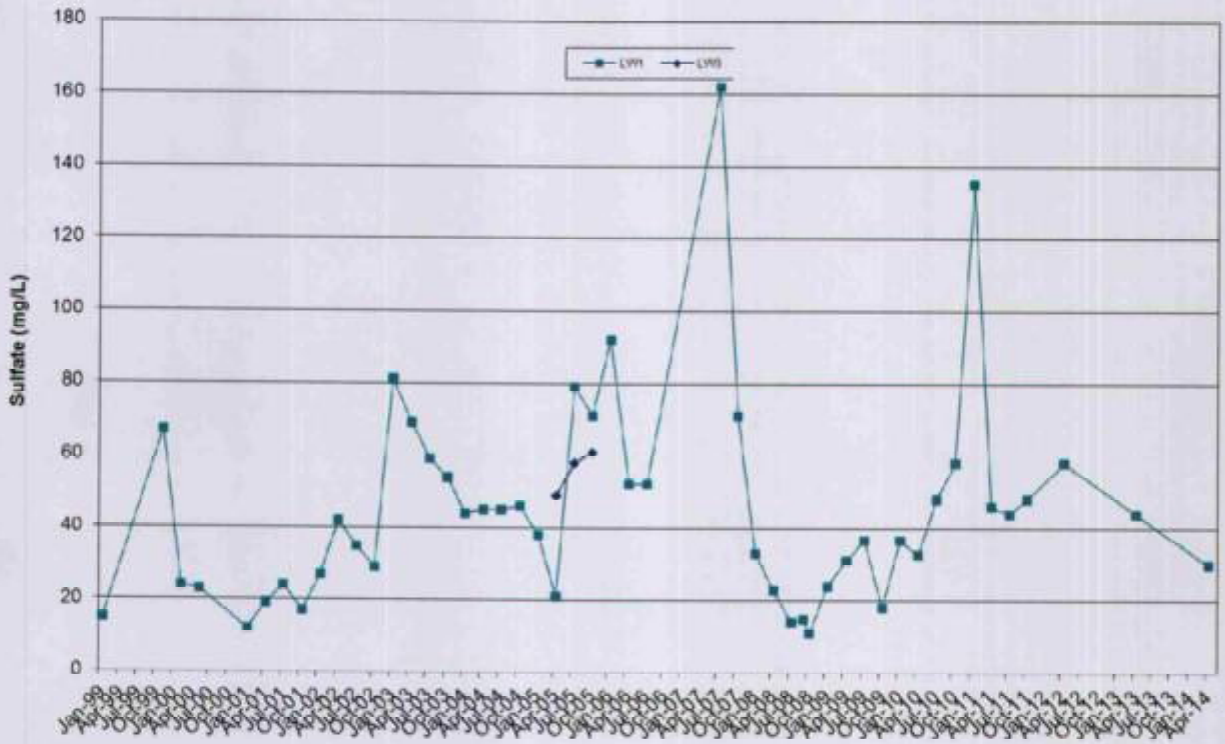

Figure 35: Leachate Sulfate concentrations – Lithgow Solid Waste Facility, January 1999 to April 2014

Fluoride was not detected in the sample collected during the reporting period (<0.1mg/L); this is consistent with historical data.

Nutrients

Ammonia concentrations are presented in **Figure 36**.

Ammonia was measured to be 0.06mgN/L, which was consistent with the established range and significantly below the guideline value for livestock drinking water (9.12mgN/L, ANZECC & ARMCANZ, 2000).

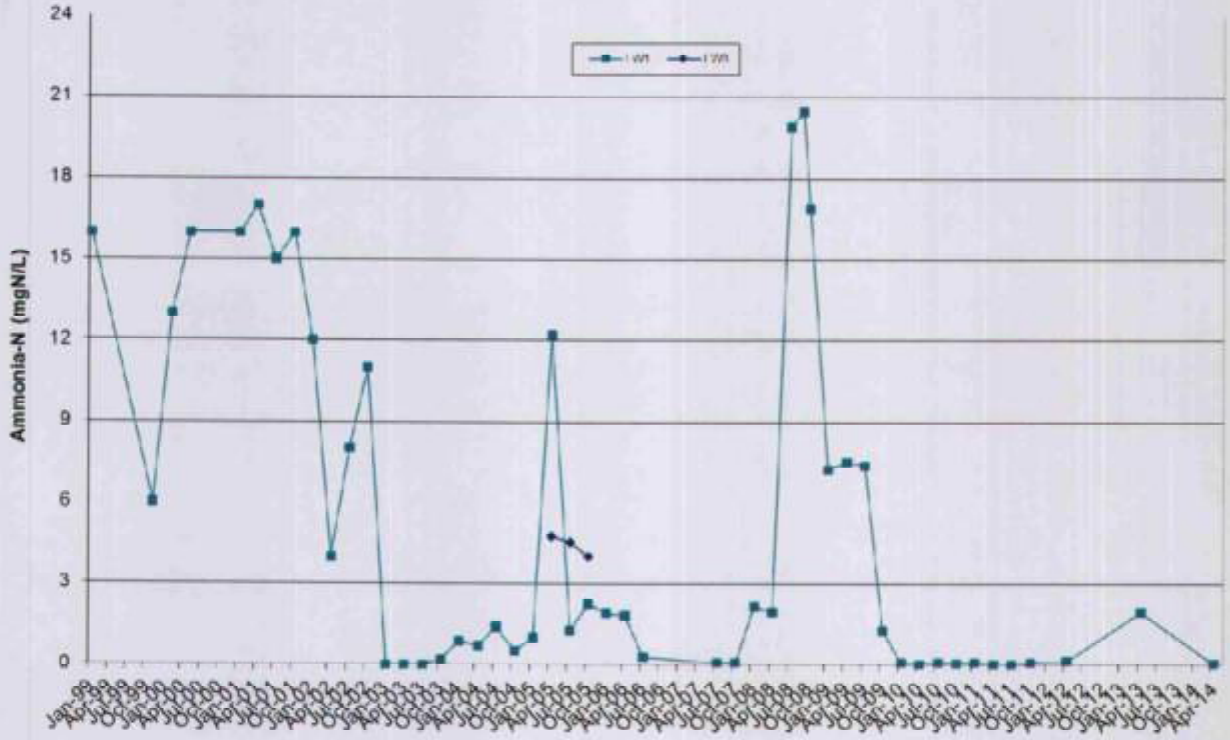

Figure 36: Leachate Ammonia (as N) concentrations – Lithgow Solid Waste Facility, January 1999 to April 2014

Nitrate concentrations are presented in **Figure 37**.

The nitrate concentration of the April sample was 4.12mgN/L, which is within the established range of the monitoring point. This concentration was also significantly lower than the livestock drinking water guideline value of 90.29mgN/L (ANZECC & ARMCANZ, 2000).

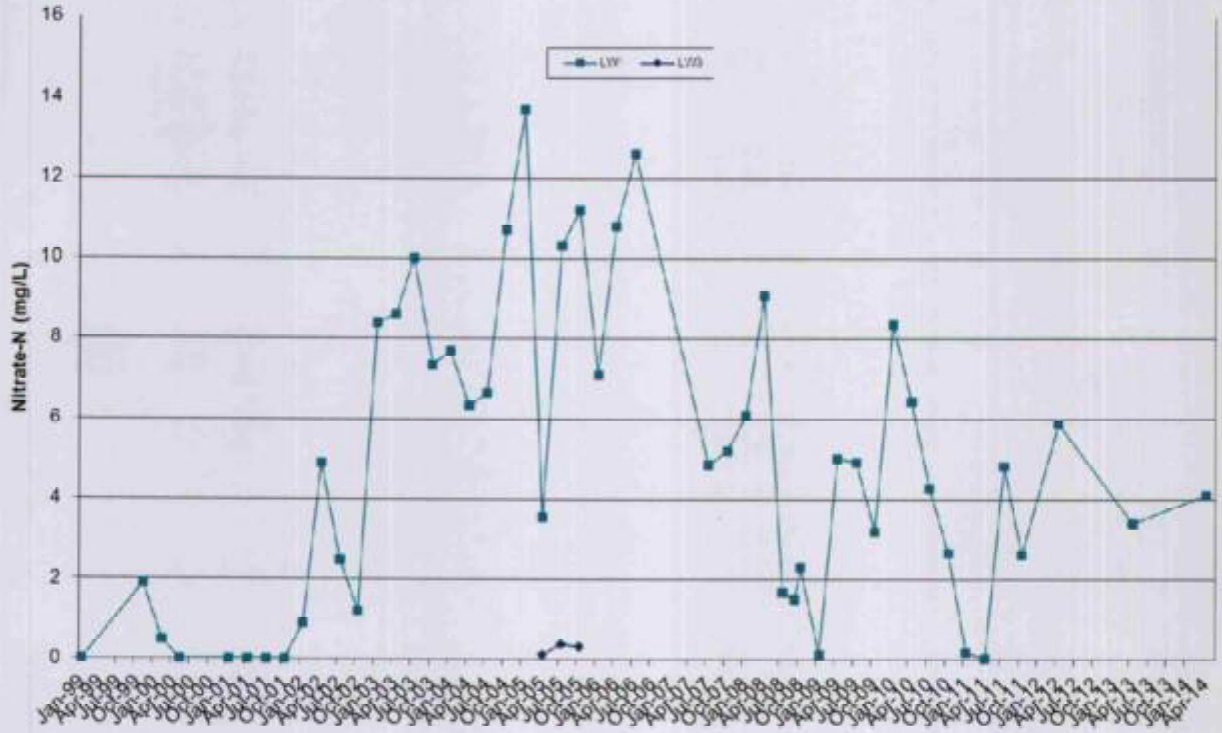

Figure 37: Leachate Nitrate (as N) concentrations – Lithgow Solid Waste Facility, January 1999 to April 2014

Metals

The leachate sample was tested for a range of metals that included iron, manganese, calcium, magnesium, potassium and sodium. Results for calcium, magnesium, potassium and sodium are presented earlier in the section.

Iron was detected at a concentration of 0.05mg/L, which is considered suitable for long-term irrigation (ANZECC & ARMCANZ, 2000). Manganese was 0.144mg/L which deems it suitable for long-term crop irrigation (ANZECC & ARMCANZ, 2000). Both values are within the established ranges.

Organics

Total phenols were not analysed in April 2014 but a subsequent sample in June 2014 was analysed for total phenols, and the result was below the laboratory limit of reporting (<0.05mg/L). This is consistent with historical data.

3.5 LANDFILL GAS

Landfill gas was monitored on a monthly basis throughout the reporting period. Monitoring consisted of surface gas measurements in capped and semi-capped areas of the landfill and accumulated gas measurements within and underneath the demountable office and toilet block located at the landfill site.

3.5.1 BUILDINGS

Monthly measurements taken within the new demountable office and storeroom located at the landfill, as well as the Sewage Treatment Plant office, crib, workshop and control room were all below the allowable threshold of 1.25% (v/v).

3.6 QUALITY CONTROL

A field quality control program was implemented in April 2001 to ensure that a high standard of consistency existed during sampling. The program included trip samples, equipment blanks and duplicate samples. The need for equipment blanks was negated later in 2001 due to the use of new disposable bailers for each piezometer during groundwater sampling at the site.

3.6.1 TRIP SAMPLES

One trip sample was collected during each sampling event and transported with the batch of samples to the laboratory. The results of the laboratory analyses are provided in **Appendix A**. The results indicate negligible cross-contamination during sampling and transportation.

3.6.2 DUPLICATE SAMPLES

One duplicate sample was collected from a select piezometer during each sampling round and compared to the original sample by calculating the Relative Percent Difference (RPD) between sample results. The RPD is defined as the absolute difference divided by the mean value.

The RPD is determined using the Equation 1.

$$RPD = \frac{|R_o - R_d|}{((R_o + R_d)/2)} \times 100 \qquad \text{Equation 1}$$

Where: R_o = analytical result for original sample
R_d = analytical result for duplicate sample

The results of the RPD calculations are provided in **Appendix A**.

The statistical variation in sample results as shown by the RPD between sample and duplicate pairs is variable, ranging from 0% to 66.7%. However only three results exceeded 25% RDP and generally, the higher values are due to the comparison of low concentrations where high variation is not considered to be significant. In general, the RPD calculations are below the criteria set by ALS Environmental Laboratories for their internal QA/QC program, indicating that the sampling methodology was consistent between samples.

3.7 WASTE QUANTITIES

Waste quantities recorded by Council and reported to the EPA for the 2013-2014 reporting year (year ending 30 June 2014) are summarised in **Table 3.1**.

Table 3.1 – Waste Data 2013-2014 Reporting Period

Sector		Total (tonnes)
Municipal	Domestic waste (other than garden organics)	6,318.76
	Other domestic waste (other than garden organics)	2,747.94
	Other council waste (other than garden organics)	896.08
	Garden organics	1,252.34
	Asbestos	84.80
	Mixed Waste	6,878.03
	Vegetation or garden	249.48
Construction and Demolition	VENM	10,470.20
	Bricks or concrete	1.34
	Contaminated soil	1,609.96
	Mixed waste	5,789.35
Waste received from other waste facilities	Mixed Waste	1,904.16
Transported Waste	Ferrous	48.00
TOTAL (excluding Transported Waste)		**38,202.44**

The total tonnage received into the landfill for the reporting year 2013-2014 was 38,202.44 tonnes. The Virgin Excavated Natural Material (VENM) component of this was 10,470.20 tonnes and the vegetation component was 1501.82 tonnes. These components are not required to be included in the calculations for total waste as this material is used beneficially for waste cover and rehabilitation. Therefore, the total waste amount for licensing purposes was 26,230.42 tonnes.

The total amount into landfill for the reporting period is below the limit set under Licence Condition L3.1, which states that the total tonnage of waste disposed of at the premises must not exceed 50,000 tonnes per annum, including no more than 5 tonnes per annum of clinical and related waste.

3.8 WASTE COMPACTION

The licence for the facility requires a minimum waste compaction of 0.65t/m^3.

Detailed survey of the landfill surface was undertaken in October 2011 and September 2014 (36 months between surveys). Data from these surveys was used to create digital terrain models of the landfill for use in volume calculations.

The landfill volume used between the two surveys was determined to be 98,886m^3.

Waste data for the past three financial years shows an average of 2,485 tonnes per month is landfilled.

Therefore it is estimated that 89,460 tonnes of waste was landfilled between October 2011 and September 2014.

Therefore, the average waste compaction for the landfill to September 2014 is 0.90t/m^3. This indicates that the minimum compaction requirement is being achieved.

3.9 COMPLAINTS

There were no public pollution concerns or complaints made regarding the operations of the landfill during the annual reporting period. There is subsequently nothing to report under Section M4 of the Licence.

Summary

4.1 GROUNDWATER LEVELS

Measurement of standing water level is required biannually by EPL 6004. Routine measurements were undertaken taken during the October 2013 and April 2014 sampling rounds. Monitoring point MB5 was sampled in June 2014 rather than the biannual April 2014 round following repair work.

Groundwater levels remained relatively constant throughout the reporting period, with some degree of variation observed at each monitoring station. The most notable fluctuations were again observed at MB6. All standing water levels were consistent with historical ranges.

The hydraulic gradient of the site falls in a south-south-westerly direction at a rate of 0.050m/m, generally consistent with the fall of the land.

4.2 GROUNDWATER QUALITY

Groundwater quality sampling was undertaken biannually, in October 2013 and April 2014. No sample was able to be obtained from MB1 as the monitoring point was dry at the time of the monitoring rounds. Monitoring point MB5 was sampled in June 2014 rather than the biannual April 2014 round following repair work.

Fluctuations in a number of parameters continued to be observed at the up-gradient monitoring point MB6 despite works to reduce surface water ingress. Despite the initial decrease in several quality parameters observed in October 2013, significant increases were observed in April 2014, indicating that surface water ingress may still be occurring. MB6 will continue to be monitored to identify the development of any adverse trend.

The increase in the nitrate concentration at MB5 recorded in June 2014 (18.10mgN/L) is significantly above the average historical value of 0.52mgN/L. Despite this result not exceeding the livestock drinking water guideline, monitoring of nitrate concentrations will continue at MB5 to identify the development of any adverse trend.

No adverse trends were evident in other groundwater monitoring points, including the down-gradient monitoring point MB14.

4.3 SURFACE WATER QUALITY

Discharge samples as required by EPL were obtained from SW1 in April 2014, the only month where discharge occurred. It is noted that results generally indicated no significant change from historical quality.

4.4 LEACHATE QUALITY

Although some variation in leachate parameter concentrations was observed during the reporting period, including some new maximum values, results were generally consistent with historical data.

4.5 LANDFILL GAS

Monthly measurements taken within associated buildings were all below the allowable threshold of 1.25% (v/v).

4.6 WASTE QUANTITIES

A total of 38,202 tonnes of waste (including VENM) was received into the landfill for the reporting period.

The total waste entombed for licensing purposes was 26,230 tonnes. This is below the maximum limit set under Licence Condition L3.1 (50,000t).

4.7 WASTE COMPACTION

The rate of waste compaction was 0.90t/m^3, which was above the requirement of 0.65t/m^3.

Conclusion

5.1 CONCLUSIONS

Despite some fluctuations in a number of parameters the results for the 2013-2014 reporting period, monitoring indicates no adverse off-site impacts resulting from the operation of the Lithgow Solid Waste Facility.

5.2 RECOMMENDATIONS

Due to uncharacteristic fluctuations that continue to be observed in a number of parameters at the up-gradient piezometer MB6, the condition of the piezometer and results will continue to be monitored to identify the development of any adverse trend.

It is recommended that environmental monitoring be continued at the Lithgow Solid Waste Facility in accordance with the monitoring requirements of Environment Protection Licence 6004.

References

Australian and New Zealand Environment and Conservation Council & Agricultural and Resource Management Council of Australia and New Zealand (ANZECC & ARMCANZ) 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.*

C.M. Jewell & Associates, November 2001, *Hydrogeological Investigation for Lithgow Solid Waste Facility*, Report No. AJ00-109.20.

Markwick, G 2007, *'Water requirements for sheep and cattle'*, Primefact 326, New South Wales Department of Primary Industries, Australia.

National Health and Medical Research Council & the Natural Resource Management Ministerial Council (NHMRC & NRMMC) 2004, *National Water Quality Management Strategy: Australian Drinking Water Guidelines.*

NSW Department of Environment, Climate Change and Water (DECCW) 2008, *Environment Protection Licence No. 6004 - Lithgow Solid Waste Facility Licence.*

NSW Environment Protection Authority, January 1996, *Environmental Guidelines: Solid Waste Landfills*, NSW EPA, Chatswood.

Drawings

EPA MONITORING POINTS

EPA ID No	LOCATION	TYPE
1	MB1	GROUNDWATER
2	MB5	GROUNDWATER
3	MB6-8	GROUNDWATER
4	MB9	GROUNDWATER
5	MB10	GROUNDWATER
6	SW1	AMBIENT WATER
7	MB12	GROUNDWATER
8	MB14	GROUNDWATER
9	LW1	LEACHATE
10		LANDFILL GAS

NOTES:

1. THIS PLAN IS PREPARED FROM A FIELD SURVEY FOR THE PURPOSE OF DESIGNING NEW CONSTRUCTIONS ON THE LAND AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.
2. VISIBLE SERVICES HAVE BEEN LOCATED ONLY. PRIOR TO ANY DEMOLITION, EXCAVATION OR CONSTRUCTION ON THE SITE, THE RELEVANT AUTHORITIES SHOULD BE CONTACTED FOR LOCATION OF FURTHER UNDERGROUND SERVICES AND DETAILED LOCATIONS OF ALL SERVICES.
3. CONTOUR INTERVAL 1M.
4. THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN.

LEGEND:

- EXISTING TOP OF BANK
- EXISTING BOTTOM OF BANK
- EXISTING TRACK
- EXISTING ELECTRICITY
- EXISTING FENCE
- EXISTING VEGETATION
- EXISTING ACCESS ROAD

SCALE 1:5000(A3)

SCALE 1:10000(A1)

GEOLYSE
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No	DATE	DRAFTING CHECK	TECH CHECK	DETAILS
A	27/04/11	LP	AB	WORKING DRAFT
B	26/05/11	LP	AB	EPL 1-6004 10N

PROJECT
LITHGOW SOLID WASTE FACILITY
LANDFILL ENVIRONMENTAL MANAGEMENT PLAN

APPROVAL AUTHORITY
ENVIRONMENTAL PROTECTION AUTHORITY
EPL : 6004

CLIENT
CITY OF LITHGOW COUNCIL

DRAWING
ENVIRONMENTAL MONITORING POINTS

PROJECT NUMBER	DRAWING NUMBER	REV
211'09	01B_EV04	B